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3 RIO 600s TO BE WON!

MESSING WITH MOBILES

FPC MAGAZINES

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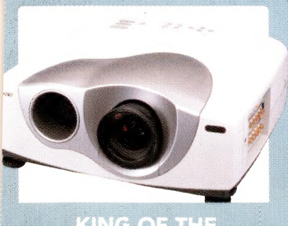

KING OF THE BIG SCREEN

FLIGHT SIMS: FACT OR FICTION?

MONITOR ANYTHING – WITHOUT WIRES!

PLUS:
- Pioneer's DTS receiver
- The Rio 600 revealed
- Build a rolling-code remote
- How it works: electrolytics
- Creative Live soundcard

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You canna break the laws of physics – unless you're in IT...

The other day I was leafing through a manual designed to help you pass your MCSE (Microsoft Certified Systems Engineer) course, and it struck me just how lucky we electronic types are.

With electrical engineering, we can calculate just about everything. Every element of a design is based on numbers, and so long as we remember the equations (or know where to look them up), we can come up with the right answer. I am, of course, over simplifying here. I know full well that there's a lot more to electronics design, but stick with me for a minute.

When it comes to computer engineering, everything is completely arbitrary, and there are no equations to fall back on. There are no formulas, no maths, no spec sheets, no load curves, no schematics, no common sense answers, even the laws of physics don't apply!

Passing your MCSE relies on being able to remember which button to push in which situation, which settings control what, and why you should avoid binding netBIOS to multiple adapters if you're running WINS. If a system fails, there's no heading in with a meter or scope, as nothing relates to the real world. You don't get any real-world feedback because nothing burns out, nothing crackles – you don't even get that 'hot electronics' smell to warn you of impending doom...

No, you're on your own, with a mouse and keyboard, and I find that thought quite sobering.

Give me a soldering iron any day.

Graham

Graham Cattley, Editor

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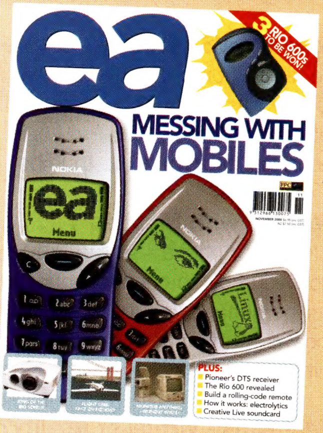
ON THE COVER



Mobile phones are remarkably sophisticated devices, and if you hook them up to your PC you can do amazing things with them. Rob Evans shows you how, on page 38.

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ELECTRONICS AUSTRALIA MAGAZINE **VOL. 62, NO. 11**
NOVEMBER 2000

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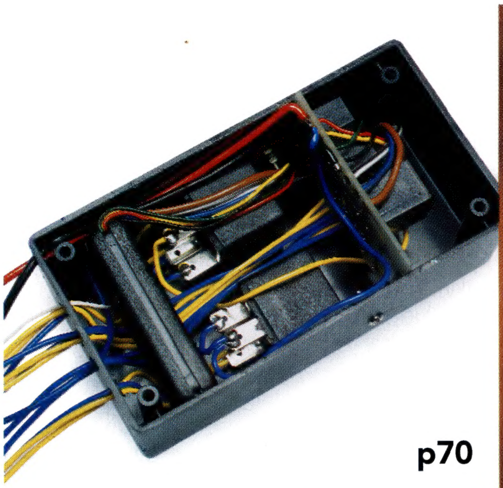
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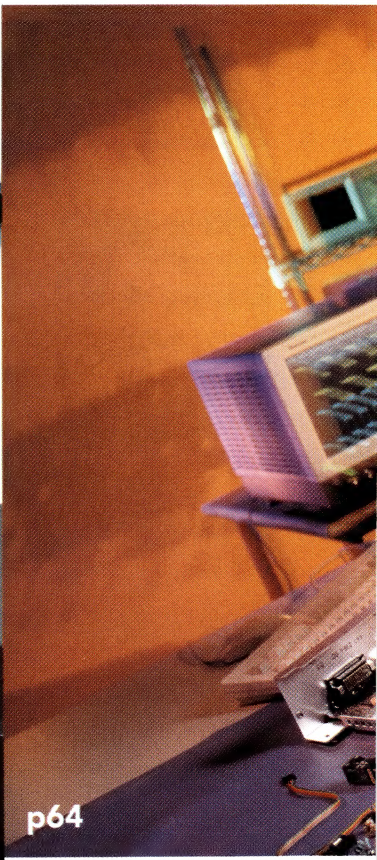
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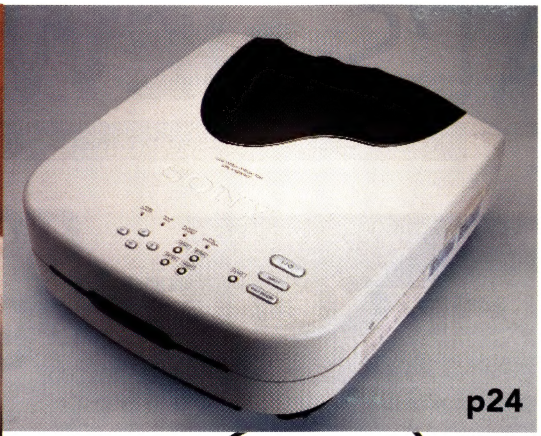

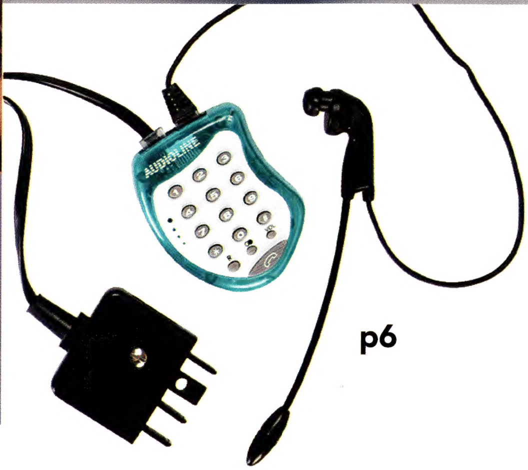

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Fuji aims high

TAKING aim at the high-end digital camera market, Fujifilm has unveiled the FinePix 4900 Zoom. It's distinctive redesign with advanced features marks a new direction for 900 Series Cameras.

Fujifilm have just introduced the FinePix 4900 Zoom, a camera that delivers a host of advanced photographic features and controls to the serious photo enthusiast.

Radically different from traditional Fujifilm digital models in terms of style, the FinePix 4900 Zoom will appeal to the hi-end market on a number of levels. Its new, cylindrical design offers the handling flexibility demanded by today's photographers, as two strategically placed shutter-release buttons make it easy to shoot either horizontally or vertically.

In addition to working as a traditional point-and-shoot camera, the FinePix 4900 Zoom can be operated manually, so the user can adjust shutter speeds, select aperture (13 steps) and control camera focus as well as white balance.

The FinePix 4900 Zoom has a fast, 6x Super EBC Fujinon aspherical zoom lens (f/2.8 - f/11) with a focal length equivalent to a 35 -210mm on a 35 mm camera, along with one of the fastest frame rates in its class at 1.03-1.36 seconds. The camera uses a 2.4 million-pixel Super CCD with ISO sensitivities of 125/200/400/800, along with an improved signal-to-noise ratio and a wider dynamic range than comparable conventional CCDs.

Additional features include a built-in miniature LCD through-the-lens viewfinder, a two-inch LCD playback monitor, an optional lens-mounting ring for use with 55mm filters or 28mm wide-angle lenses, and AVI video capture/playback mode with sound.

With dimensions of 109 x 78 x 94mm, the FinePix 4900 ZOOM weighs in at 400g. An included NP-80 Lithium-Ion battery can be recharged inside the camera with its bundled AC-5V adapter. Also included in the package is Adobe PhotoDeluxe 4.0 Home Edition image editing software.

■ *It will be available in November and is expected to retail for approximately $2,500. For more information visit www.hanimex.com.au or contact Hanimex Customer Service on (02) 9466 2900. For calls from outside Sydney, call 1800 226 355.*

Camedia's Ultrazoom

NEW from Olympus is the Camedia C-2100 Ultra Zoom. This model features a bright 10x zoom lens with an aperture range of f2.8 to f3.5 — a combined specification that has hardly been accomplished in regular film cameras for broad consumer usage.

As well, it offers an image stabilising system, a 1/2-inch CCD with 2.11-megapixels and a 38-380mm optical zoom, plus a 2.7x seamless digital zoom function. With a shape carefully designed for comfortable holding, a colour TFT viewfinder, a wide angle LCD monitor, a USB connector and a motion picture function, it is truly an all-in-one camera.

In sequential mode, shooting can be as fast as 1.8 frames/second and it also can take QuickTime Motion JPEG compatible motion sequences up to a maximum of 134 seconds. With the inclusion of the Olympus unique image stabilising system, this camera can achieve steady, high picture quality even at 10x zoom. Combined with the digital zoom, an ultra-zoom can reach the length of equivalent to 1000mm in the 35mm film format.

■ *For further information, contact R. Gunz (Photographic), Phone: (02) 9935-6600, who also have offices in Melbourne, Brisbane, Adelaide, and Perth.*

Colour TV

HITACHI have been awfully busy recently, extending their television range to cover all needs and tastes, as well as budgets.

First up is the new C2988FS 'All Gold' 68cm TV, which features a classy new-look chassis that complements the style of today's decor. It also features Dynamic stereo sound with side-mounted speakers and 20W output. Price? Around $1249.

For those wanting the benefits of a flat screen, Hitachi have brought out the 68cm C29F200, with Super-Flat technology and powerful sided-mounted speakers with Spatializer Surround Sound. (it seems everybody has Spatializer Sound these days...) Hitachi claims this new television is ideal for use with DVD players and for use in brightly lighted rooms when colour purity is paramount.

Adding to Hitachi's colour theme are two new rear projection televisions with 'European-Look' silver chassis and striking blue speaker covers. The Ultravision C50-F200P 50-inch unit is the latest in the Award-Winning RPTV from Hitachi. Advanced features such as Auto Digital Convergence, 1000-line resolution and HDTV quality lens ensures continued wide demand while the powerful blue-Look audio system with Dolby Pro Logic Surround Sound gives you the real theatre experience as well as matching the appearance of your other state-of-the-art home theatre equipment.

■ *With DVD component input and P-in-P dual tuner, this really is the TV for the new Millennium, at the millennium price of $5,799. All products are available throughout Australia from leading retailers.*

World's first 7.1 Channel Amplifier

Denon have announced the world's first 7.1 channel, Surround Sound amplifier with DTS-ES Discrete 6.1, DTS-ES 6.1 Matrix, and THX Surround EX.

Simply put, the Denon AVC-A1SE is the first amplifier to support; front, left, middle and right, left and right surround and surround rear discrete information, all encoded in the DTS-ES Discrete 6.1 format.

DTS-ES Discrete 6.1 Extended Surround is the latest incarnation from Digital Theatre System (DTS) and employs proprietary technology for the playback of discrete, 6.1 channel content from DVDs and CDs.

In addition to its seven channels of amplification, the AVC-A1SE is the most advanced and versatile Home Theatre amplifier on the market. Its Multi-Zone Output and Select functions allow you to output different sources up to two additional listening areas, together with the main room.

For example, one area can be listening to a DTS-ES 6.1 encoded film track, another a CD source, and a third area can be enjoying music from the tuner. All that is needed is additional power amps and appropriate interconnect cabling.

To enhance the very best sound quality from the DTS-ES Extended Surround format, Denon have employed Analog Devices' melody DTS-ES Extended decoder and their SHARC 32-bit floating point DSP device, the most advanced DSP device on the market. This is the first DSP implementation to support the DTS-ES program.

Outstanding sound quality is also attributed to the use of 16 Analog Devices' high resolution 24-bit/192kHz DACs, acclaimed to be the industry's highest performance audio D to A converter, unprecedented in its ability to decode all legacy DTS sound tracks.

It's one thing to have the latest decoding firmware, it's also imperative to have ample power to recreate similar levels as the film directors intended. For this reason the AVC-A1SE offers 170 watts RMS into all seven channels, with all channels having a frequency response from 20Hz to 20kHz.

In summary, the AVC-A1SE offers 13 sets of analogue inputs including phono, CD, tuner. DVD, VDP, TV, DBS/SAT, V-AUX, VCR-1, VCR-2, VCR-3 CDR/tapes and MD/tape 2. It also features 2 sets of 8-ch analogue EXT inputs for use with up to two other 7.1 multi channel front end systems.

■ *The AVC-A1SE has an RRP of $6999, is covered by a national two-year parts and labour warranty and is available at selected dealers only. For further information, contact Audio Products Australia Pty Ltd on 1800 642 922 or email: info@audioproducts.com.au.*

Tau TVs from Panasonic

PANASONIC has expanded its range of flat screen T (tau) televisions, with the addition of three new silver models.

Consumers now have ten Panasonic flat screen models to choose from, as well as plasma and rear projection Tau. The new models are the 68cm stereo TC-68PS10A ($1649), the 51cm stereo TC-51PM10A ($714) and the 36cm mono TC-36PM10A ($527).

The new models incorporate the Quintrix F flat picture tube that delivers natural and accurate images and text from corner to corner, free of the warping and distortion that occurs with conventional curved screens.

The company has also introduced new picture improvement circuitry for extra brightness as well as vivid colours and enhanced contrast. This includes NTSC cross colour reduction circuit, black level expansion circuit, and horizontal sharpness control. The stereo model TC-68PS10A also offers DVD (component video) input, which allows direct input of signals from DVD discs in their original format — ensuring outstanding picture quality and accurate colour reproduction. All three models are compatible with PAL and NTSC system DVDs and video tapes.

Other advanced features offered by the range include an easy to use menu for making settings and adjustments; a picture menu with three preset picture modes (dynamic, standard and soft); preset channel colour settings; white balance adjustment; child lock; and wake-up timer, which programs the TV to switch on at a selected channel and designated time.

■ *For more information, contact the Panasonic Customer Care on 132 600.*

Sony's Bigshot

SONY has introduced a new model of Cyber-shot Digital Camera in Australia, the DSCF505V, offering 3.3 mega-pixel CCD and new Interpolation technology. The new Cybershot is equipped with 3.3 mega-pixel resolution, which is a 50 percent increase over its predecessor, the DSCF505.

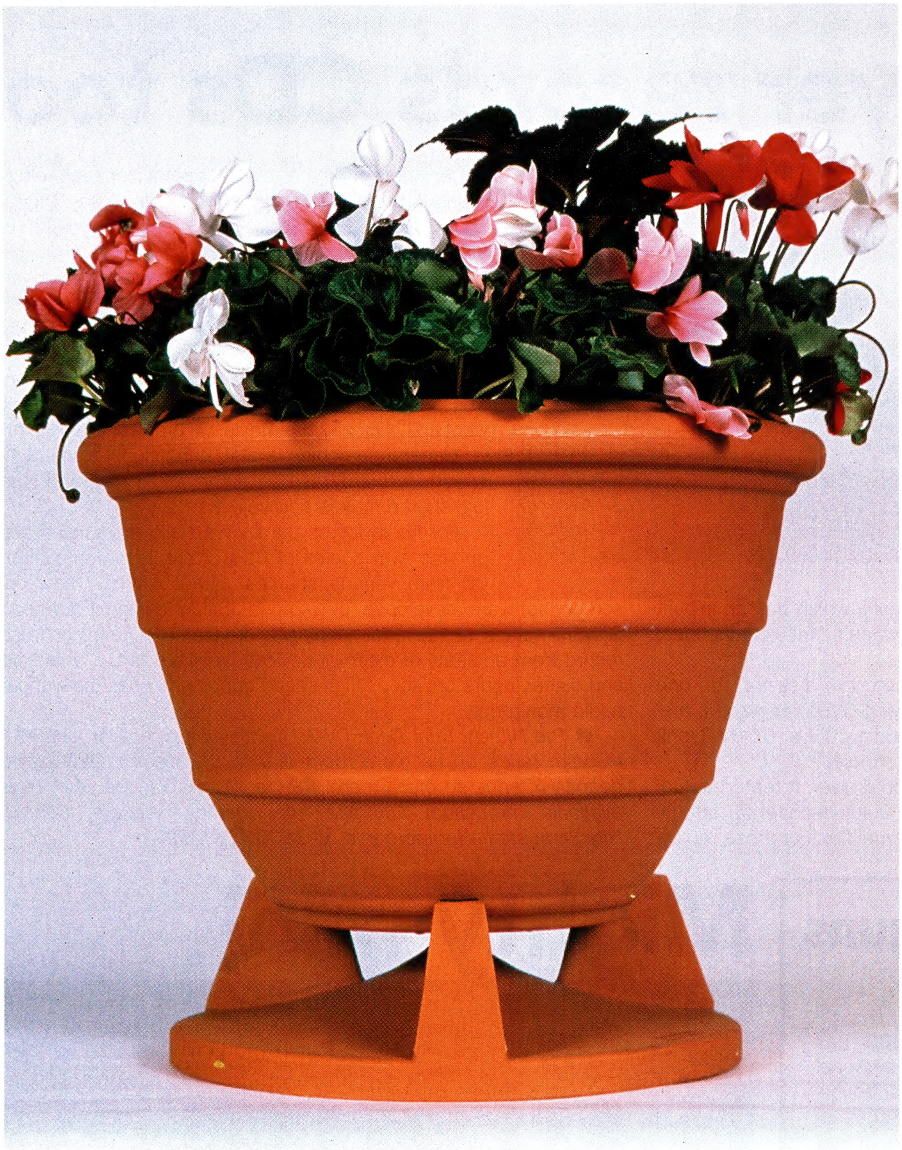
Its 3.7 mega-pixel interpolated mode provides the largest image size among all Sony Digital Camera models.

Yoji Higashida, Sony Australia's Product Manager for Personal Video. Said that he hadn't planned on introducing this camera to the Australian market, but the overwhelmingly positive reaction to the DSCF505, earlier this year, encouraged him to review his decision. "The combination of style and substance is very appealing to the Australian consumer," he said.

You'll find many improved features in the new model DSC-F505V, such as TIFF mode for maximum colour fidelity, in-camera image resizing options, and 12-bit A/D conversion for wider dynamic range.

The DSC-F505V features an advanced Carl Zeiss Vario Sonnar Lens and a 5X optical and 10X precision digital zoom. Moreover, it offers a new, built-in red-eye reduction intelligent flash and an external flash terminal, which can be used with an optional flash for better exposure.

■ *For more information on the new Cybershot, contact the Toll Free Sony National Consumer Infoline on 1300 13 SONY (7669) or visit **www.sony.com.au.***



Talk about pot music

AH, the peace and tranquillity of one's beautiful garden; the sweet sound of the birds in the trees singing to the newly risen morn, the soft sighing of the branches in the breeze, and maybe the gentle music of water, playing over smooth dark river pebbles.

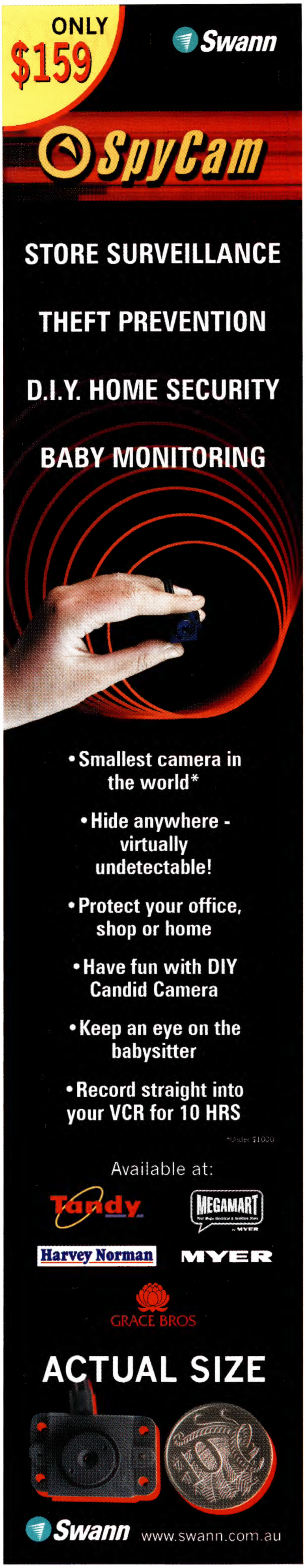
BRING ON BRUCE SPRINGSTEEN!

Yes, Rockustics, that leading manufacturer of high-fidelity outdoor speaker systems has rounded out its Garden Series product line and gone and added the Omniplanter, a large, circular floor planter delivering 360° of dynamic, omnidirectional sound.

Designed to accommodate live plants and allow for adequate drainage, the new Omniplanter is ideally suited for a variety of applications, including outdoor decks and patios, amusement parks, hotel and restaurant settings and lobby areas.

With 70 Watts of power, the 24 x 20" plastic pots come with a lifetime warranty and are 100 percent water and weather proof, and proven to resist rain, frost, snow and ice. You'd hope so, at US$900 a pair...

■ *If we could, we'd also show you their hanging basket sound solution, Coconutz, but we don't have an image of these no-doubt tastefully designed devices. Instead, why don't you head on over to* ***www.rockusticsinc.com*** *where you'll find out about these and their 25 other outdoor sound products.*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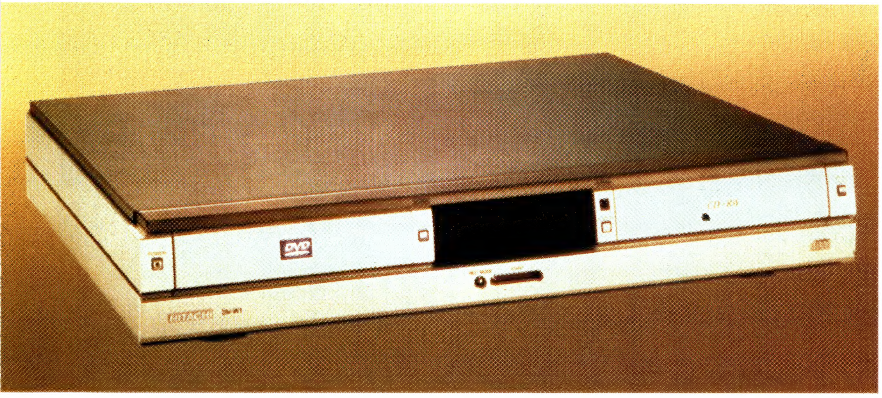

THERE'S a new DVD Player out from Hitachi, which has an in-built audio CD Recorder. They claim it to be a world's first, and the ideal product for home entertainment use.

The model DV-W1A consists of two separate disk trays in one slimline unit. The left-hand tray is for playing DVDs, or place a prerecorded CD into the same tray, pop an audio CD-R or CD-RW blank disk into the right tray and copy. It's that simple.

As a DVD player, the new Hitachi is top drawer. It features dual laser technology, 10-bit DAC and in-built Dolby decoder for attachment of a 5.1 Surround-Sound- channel amplifier. For those replaying on stereo TV the in-built Spatializer technology gives a Surround-Sound effect from Dolby Digital soundtracks. Playback of DTS encoded disks is also possible.

Hitachi's unique Disc Navigation has been enhanced in the DV-W1A ensuring ease-of-use is the hallmark of this new deck. It now automatically builds a 'Scene Selection Menu' displaying each chapter or major scene, which when selected by the remote control, plays 5-second loops. If that scene is what you want just click and the movie will play from that point.

General searching is also enhanced via the high-speed forward/reverse scan of 120x and the jog/shuttle makes fine selection easy.

For Audio lovers the DV-W1A allows you to make up your own copies of CDs or create a compilation CD from various sources. Either way the new on-screen software developed by famous Italian designer Eduardo Galvani makes set-up and dubbing a breeze. This unit can also record from a variety of external devices by virtue of the analogue and digital inputs provided. High-speed dubbing is possible without audio monitoring.

■ *The Hitachi Dual Deck DV-W1A with dimensions at just 92 x 435mm takes up no more room than a stand-alone DVD player despite offering so much more. RRP is $1449.00. The DV-W1A is available throughout Australia from leading retailers. Contact Hitachi Australia for more info on 1800 789 799.*

Check those guns at the door...

DICK SMITH ELECTRONICS has released an easy to use personal metal detector. It is ideal for bouncers, door persons and any other situation where concealed metal objects are considered a threat.

The Personal Metal Detector features high detection sensitivity and provides quick detection of metal items. With adjustable sensitivity levels, the detector will sound audio beeps and flash LED lights on detection of any metal items.

Operating via a 9-volt battery, the Personal Metal Detector has a low battery detector light that alerts the user when a new battery is required.

■ *The Personal Metal Detector is available from Dick Smith Electronics Australia wide for a retail price of $32.62. It is also available via mail order by calling Dick Smith Electronics Direct Link on 1300 366 644 or visiting their website at* ***www.dse.com.au.***

Mighty mini

PANASONIC HAS RELEASED a mighty mini system — the SC-DK2 — featuring a Dolby Digital decoder and a 5-disc DVD/VCD/CD changer.

This compact yet powerful model is an excellent home theatre system with rich sound that will fill any living room. With it, you can experience Dolby Digital surround sound, with 400W total power. In home theatre mode the SC-DK2 delivers 130W to the front speakers, 70W to the centre and 35W x 2 to the rear.

Features designed to make the most of the DVD experience include digital cinema mode, which allows users to enjoy films with more cinema-like luminance and colour. This feature also improves the visibility of dimly lit scenes and avoids colour smearing. A 10-bit video D/A converter provides the crispest, most noise-free picture possible.

■ *The SC-DK2 is available from leading electrical retailers and hifi specialists, priced at $1599. for more information contact Panasonic Customer Care on 132 600.*

Marantz DVD player

MARANTZ HAS RELEASED its DV-3100 DVD player that at only $899, offers performance and features far above others in this price range.

The DV-3 100 is designed to accommodate CDs, CD-Vs, and of course DVDs, plus it offers the latest configuration outputs including Component Video Output, S-Video, as well as standard video/audio outputs.

As a DVD player, it offers a full complement of viewing options and interactive capabilities including multiple camera angles and aspect ratios, a choice of language tracks and subtitles, parental control and more. It also features the usual convenient functions such as Slow Motion, Freeze Frame, Multi-speed Forward and Reverse Scan, Chapter and Track Search functions.

Another handy feature is a Zoom Mode that at a push of a button allows the user to "zoom-in" up to 16 times normal size. Users can select the TV aspect to ratio in any one of three sizes; 4:3 letterbox (for material not formatted in the Pan and Scan style), 4:3 Panscan (conventional TV set size) or if you posses a wide screen TV or monitor, 16:9 wide mode offers the benefits of today's wide screen formats.

■ *The Marantz DV-3100 has an RRP of $899, is covered by two-year parts and labour warranty, and is available at selected Marantz dealers.*

Super Audio CD

PURE AUDIO is the way Marantz describe their new Super Audio CD player, the SA-1.

Super Audio CD (SACD) offers the highest possible audio quality in the CD format and is a breakthrough in recording technology, data encoding, storage techniques and laser optics. It offers full compatibility with the existing CD format.

Marantz have adapted Direct Stream Digital or DSD signal processing as the starting point in the developing of their unique SA-I Super Audio CD player. Originally developed for digital archiving of analogue master tapes, DSD is a revolutionary process based on 1-bit delta modulation techniques.

■ *The Marantz SA-I is covered by a two-year warranty, has an RRP of $11,999 and is available at selected Marantz dealers.*

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upload

Computer news and new products

NEWS

■ Any remaining mobile phone etiquette may be doomed if NTT DoCoMo Inc, Japan's largest cellular operator, introduce their new interactive watch phone. The wrist device has a sensor mounted on its underside that includes both a speaker and mic. The speaker faces inward so that the sound vibrations travel through to your finger, which is inserted in your ear to hear the call. The microphone faces outwards and picks up sound from your mouth, since your wrist is naturally nearby – go on, try it.

■ NEC have developed a new type of LCD that uses reflected ambient light to illuminate the screen, rather than backlighting. The 3.8-inch active matrix TFT display consumes just 40mW, while an equivalent backlit screen gobbles 1 or 2 watts for the same result.
Targeted at the power-conscious portable device market, the screen has a resolution of 320 x 240 pixels and is the first commercial screen to reflect around 40% of the incoming light.

■ In true early-bird style, online PC retailer BzBoyz.com offered AMD's new 1.2GHz Athlon chip on the *eve* of its official launch. With the price still to be announced by AMD, the dealer listed the chip at US$491 on their website.
The 1.2GHz Athlon is the fastest AMD chip yet, and has a 384K on-chip cache, a 200MHz system bus, and 3D Now! technology. Look out Intel...

Canon's scanners

Canon have released a whole new range of imaging products, so we thought we'd have a bit of a look at what they have to offer. If you are interested in any of these products, contact Canon on (02) 9805 2000

CanoScan FB1210U

▲ A professional quality 1200dpi scanner at a consumer price.

Key points:

The new CanoScan FB1210U includes high-end 1200 dpi colour image capture at a low price of $499, and optional film scanning for just $199.

With a high price-performance standard, the CanoScan FB1210U features a new 'Galileo' lens, 42-bit colour input and output and a high speed USB interface.

It boasts a striking industrial design with an aluminium lid, and features true optical 1200dpi scanning, 42-bit colour input and output, fast USB interface for Windows and Macintosh and optional film scanning.

CanoScan N340P, N640P

▲ An improved version of their popular easy-to-use, and low-cost scanner.

Key points:

Improved 42-bit input CanoScan N340P and CanoScan N640P replace the popular CanoScan FB330P and Cano Scan FB630P for Windows PCs.

Compact design, with both scanners using Canon's exclusive LIDE technology for accurate colour scanning with no distortion.

The super slim CanoScan FB340P and CanoScan FB640P, both offer an easy-to-use advanced scanning solution at a low cost of $1392 and $1892 respectively. The new scanners maintain their trademark compact design with improved 42-bit input colour scanning for more subtle and 'true-to-life' colours in addition to an enhanced software bundle.

Both scanners connect simply via a parallel port with an optical resolution of 300 x 600 dpi and 600 x 1200 dpi respectively, and offering selectable resolutions up to 9600 dpi for line art scanning.

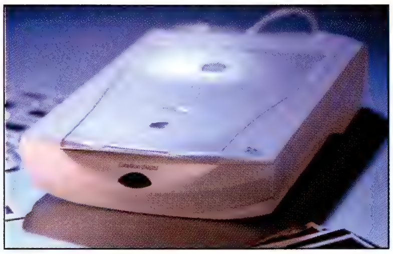
CanoScan D660U

▲ An all-in-one scanner, capturing images for documents and film at an entry-level price.

Key points:

The CanoScan D660U delivers 600 dpi flatbed colour scanning and built-in 1200 dpi 35mm film scanning at a low price of $299.

Canon's latest scanner is feature rich with 42-bit colour input, a comprehensive suite of software and a high speed USB interface for Windows and Macintosh systems.



The CanoScan D660U is ideal for capturing photos, slides and designs for Web pages, school, creative or work projects. Delivering the benefit of an all-in-one image and film scanner the CanoScan D660U takes advantage of Canon's unique optical glass and lens system known as VAROS (Variable Refraction Optical System) for high-resolution slide and film scanning.

Canon BJC-6200 colour printer

▲ An easy-to-use printing solution including 1440 dpi high resolution output.

Key points:

The new BJC-6200 colour Bubble Jet printer supersedes the popular BJC-6000 with improved features and faster printing speeds.

Colossus comes out of hiding

by Richard Berry

The world owes a debt of gratitude to a band of British hackers. In 1938, England's best mathematicians and scientists were asked to develop a way to crack the Enigma, the code used by the Germans to communicate wartime intelligence. The result was Colossus, the world's first electronic digital computer.

Its successor, Colossus II, went into operation on June 1, 1944, just in time to intercept a coded message which confirmed that Adolf Hitler and the German high command had fallen for an Allied ruse suggesting that the long expected cross-channel invasion was aimed at the Calais area, rather than the Normandy beaches.

Armed with this knowledge, supreme Allied commander Dwight D. Eisenhower forged ahead with plans for Operation Overlord and on June 6, the western Allies landed at Normandy in the largest seaborne invasion in history.

Last month, the Government Communications Headquarters at Cheltenham, England, officially declassified its documentation of the Colossus project, releasing a two-volume report to the Public Record Office, the national archive for the entire United Kingdom.

Based on plans developed by a 26-year-old mathematician named Alan Turing, Colossus changed the course of World War II and established the groundwork for modern computers, said John Dinsdale, a retired professor of World War I and II history who, inspired by the story of Colossus, now studies the history of technology.

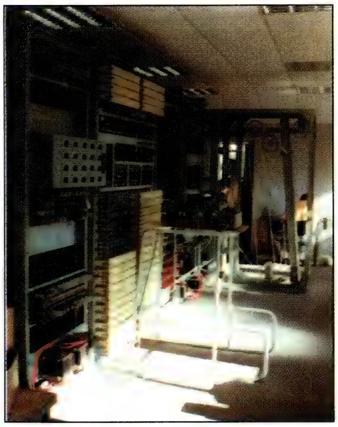
"The men who worked on the Colossus project would no doubt be called hackers today," Dinsdale said. "Like all good hackers they used their wit and wile and found a backdoor that gave them access to some very crucial information" he added.

Electronic Brain

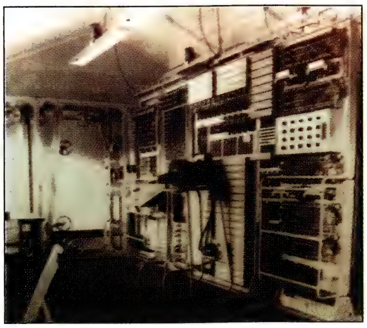
Turing had already developed plans for what he called an "electronic brain", a machine that could do high-level mathematics, when he was recruited for the code-cracking project, Dinsdale said. "And as it turned out, Turing's machine was also perfectly suited to breaking the Germans' binary-based Enigma code."

Dinsdale said Colossus was not a true computer by today's standards — "more of a revved-up calculator" — but it could factor logical problems and was programmable to some degree. The Colossus project has long been an 'open' secret, well known to anyone interested in computer history, said Ian Foley, a London network manager.

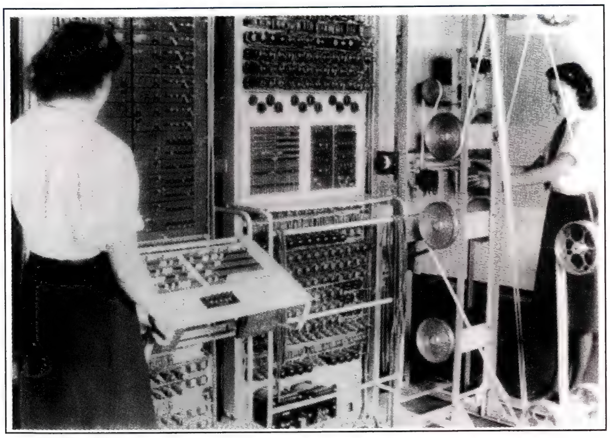
Foley remembers reading about the Colossus computers when he was in school during the 1970s — "Not the full technical specs, mind you, but just the background on the project."



A shot *of the replica Colossus in Bletchley Park's computer museum.*



Above*, the original Colossus machine developed in 1943 to analyse the rotor settings for the German encyphered teletype messages. Using around 1500 valves, it was arguably the world's first programmed electronic computer.*



The Colossus project was headquartered at Bletchley Park, which is now open to the public. Bletchley has a working reconstruction of Colossus **www.bletchleypark.org.uk**.

"The Colossus rebuild was done several years back by a brilliant gentleman named Tony Sales," Foley said. "He sorted out how to reassemble the machine from the few scraps of technical information he could lay his hands on."

Foley said that he recently asked Sales if he wished that he'd waited to start work on the reconstruction until the report had been released. "I noted that it certainly would have been an easier job if he'd had all the specifications to hand. But Sales said no, not really. He'd appreciated the challenge."

Sales was unavailable for comment.

Out of hiding

According to a spokeswoman from the British Public Record Office, the 500-page Colossus report features detailed specifications, design notes and photographs of Colossus and Colossus II. It is not yet available online at **www.pro.gov.uk** but is expected to be uploaded by the beginning of November.

Despite the widespread general knowledge of the Colossus project, the British government had carefully shielded all information about the technical details.

By law, the vast majority of British records that are selected for permanent preservation must be made available to the public when the records are 30 years old, a PRO spokeswoman said. But some records can be legally kept classified for as long as 100 years, depending on the information's possible impact on national security or international relations, the spokeswoman said.

Due to the British government's refusal to release technical information about Colossus project, there is a bit of an international tussle over whether the British or Americans should be credited with developing the first electronic digital computer.

Technology historian David Fleps of Rutgers University says that "on the record" credit goes to the Yanks' ENIAC machine **www.seas.upenn.edu:8080/~museum**, which was up and running in 1946. But Fleps also notes that Colossus II not only was operational before the ENIAC, but was also able to process more data.

"When the credit was being handed out, the British government chose to remain silent about the Colossus. It's believed that they wanted to continue to use it during the Korean War, and so they didn't want attention drawn to the project," Fleps said.

It wasn't until the 1970s that any information at all about the Colossus project was declassified — too late for many of the Colossus developers to get any credit for their accomplishment. "It is a rather sad story, from the human side," Fleps said.

e-music

your guide to digital music

NEW STUFF

Pining for D'music

▲ It looks like a personal CD player, but Pine's D'music SM-200C CD player has a trick up its sleeve. Yup, you guessed it, Pine's little baby plays MP3s burned to disk as well as all your conventional CDs.

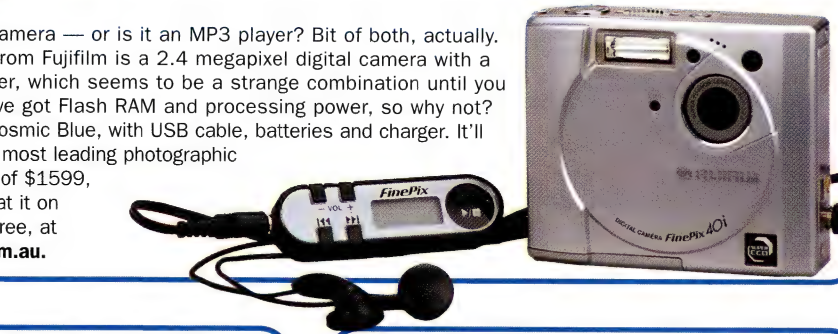
Quite why you'd want to play conventional discs, we don't know, because you can fit eight to nine CD's worth of music onto one MP3 disc, and play the songs back for 10 hours straight without repeating. It sure beats carrying a pile of CDs around with you...

The SM-200C offers ID Tag display, anti-shock CD playback, AC adapter and a Lithium battery pack, and is so new, that we don't have a price yet... We're guessing at around $400 though. Phone David Reid Electronics on (02) 9267 1385 for details.

See hear

▲ It's a digital camera — or is it an MP3 player? Bit of both, actually. The FinePix 40i from Fujifilm is a 2.4 megapixel digital camera with a built-in MP3 player, which seems to be a strange combination until you realise that you've got Flash RAM and processing power, so why not?

It comes in Cosmic Blue, with USB cable, batteries and charger. It'll be available from most leading photographic stores at an RRP of $1599, but you can look at it on their website for free, at **www.hanimex.com.au.**



Hippy Zippy

▲ Iomega have jumped into the digital music market with their new HipZip, a personal player that uses not the usual Flash RAM, but PocketZip disks instead. (For those in the know, PocketZip disks are a new name for their Click! Disks). Iomega claim that the individual PocketZips are a lot cheaper than conventional silicon memory formats, at $21 per 40MB disk. Which is true. The player supports MP3 and WMF music formats, and can be upgraded to support Audible and Dolby AAC files too. The HipZip has an RRP of $669, and should be available within the next few weeks. They're a bit thin on the ground at the moment, but stay tuned for a review in the next few months!

Rugged recording

▲ If you are looking for rugged digital recording, look at the Portadisc MDP500 MiniDisc recorder from HHB. It has a rigid steel chassis, XLR mic inputs with phantom power, a six-second record buffer, and is the only MiniDisc recorder to offer a USB interface to transfer audio to (and from) your PC. If you are into MiniDisc on the move, then the Portadisc is the most professional recorder we've seen. **www.hhb.co.uk** is the place to go for all the info.

NEWS

■ Mp3.com buys a million songs
MP3.com has paid $30 million to four major music publishers for the rights to host their music online.

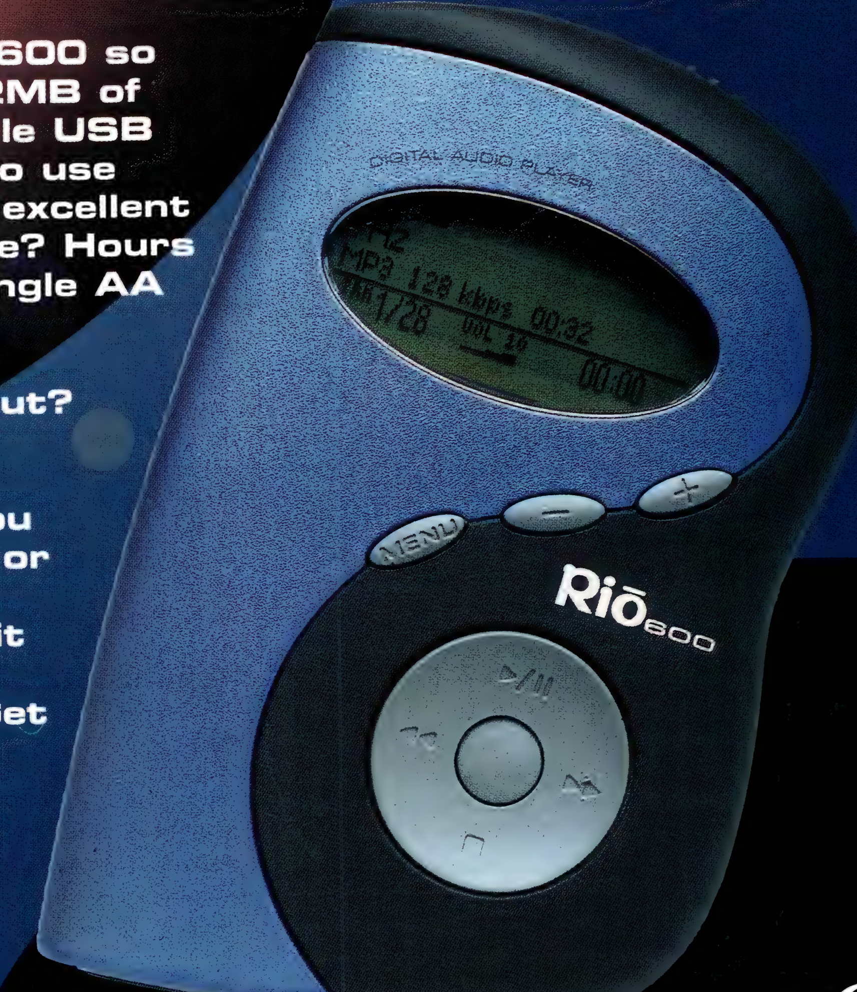
After having broken copyright law by creating a database of over 800,000 songs on their My.MP3.com site, MP3.com has settled with four of the five offended publishers. The fifth label, Seagram Co.'s Universal Music Group is still holding out for $250 million in damages.

With MP3.com's appeal still underway, the beleaguered My.MP3.com service will pay a quarter of a cent for every song accessed on the site, and an undisclosed sum each time a user stores a song on the service.

■ It's all too, too much...
Napster's Vice President of Marketing, Liz Brooks, has resigned two weeks after Napster met with members of the recording industry before a federal appeals court. While Liz has moved on to iCast Music, Napster are looking to fill her position. "We look forward to finding just the right person to help take Napster to the next level," said Milt Olin, Napster's COO.

■ Napster for President
Both Al Gore and George Bush got in on the Napster debate, with the two US Presidential candidates arguing over the way in which their ▶

Get the music
Your music, your choice
WIN A RIO 600!



What makes the Rio 600 so good? The built in 32MB of RAM? The ultra-simple USB interface? The easy to use control system? The excellent Rio Manager software? Hours of playback from a single AA cell? The switchable coloured fronts? Its excellent quality output? We could go on...

Instead, why don't you tell us? In 25 words or less, tell us which features would benefit your digital music listening the most. Get inspired, as the best use of all of these features wins one of three Rio 600s we are giving away.

Entries close on Friday the 30th of November, so hurry!

You can enter via our website (www.electronicsaustralia.com.au), or mail you entry to:

Rio 600 Giveaway
EA Magazine
PO Box 199 Alexandria
NSW 2015

Rio

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NEWS

administration would handle the online music situation.

The political website Web White & Blue posed the question "In light of the recent Napster case, what are your views on Internet file-sharing and the protection of intellectual property online? Where would your administration draw the line regarding freedom to access content versus copyright infringement?"

Bush, wouldn't be drawn to comment on Napster directly, but said the they must "find a way to apply our copyright laws to ensure that artists, writers and creators can earn a profit from their creation."

Democrat candidate Gore said that the controversy surrounding Napster was similar to the objections raised when radio was first introduced — which was seen a similar threat to songwriters. His answer was for a compromise so that "Napster-type technologies can flourish, but not take away the artist's intellectual property."

How do you want that?

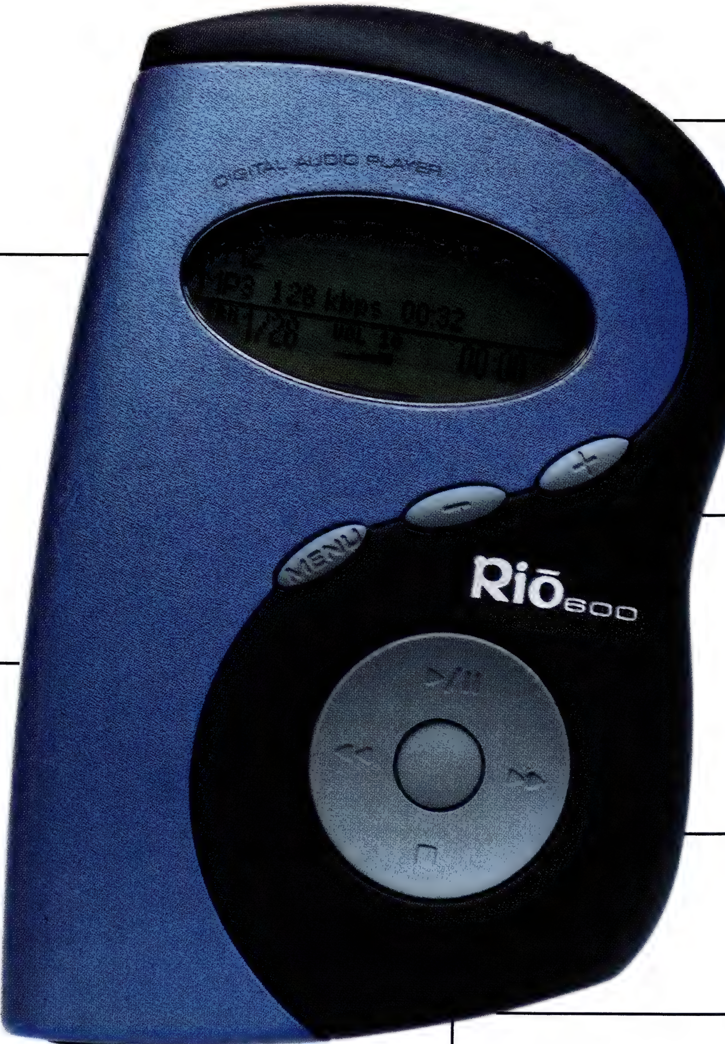
ETC Music has the support of S3 (via their Rio division) to develop the MusicTeller digital music player.

The MusicTeller is similar to an ATM (automated teller machine), and allows traditional record stores to offer digital music for download to in-store customers.

Users will be able to plug in their digital music player, and instantly download either free promotional tracks, or pay for archived, live, or previously unreleased material.

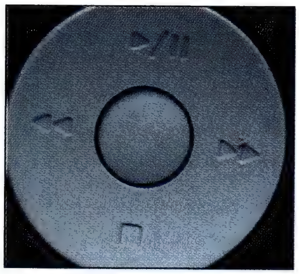
Review: Rio 600 digital music player

It's cute and curvy, and is *the* thing in digital music players these days, if you believe all the hype from Rio. Lots of hype usually means that the product can't stand on it's own two feet, but in the Rio 600's case, this isn't the case. Ok, so it doesn't have a radio or voice recording as found on cheaper models, and its custom memory format means that you'll have to buy any upgrades direct from Rio, but its swish design, and removable designer faceplates will appeal to the people who matter - those who want an digital music player without having to get a degree in computer science to go with it.



Controls:

The obligatory round central button for Play/Pause, FF/Next track, RW/Last track, and Stop. There's only the Menu and volume buttons apart from that, so it's not too confusing to drive.



Menu:

The menu takes full advantage of the rather small display, with a series of file tabs popping up when you press the menu button. Navigation is simple, with the centre of the four-way control button acting as a select key. All up, simple and straightforward.

Data:

As with most players these days, the Rio 600 uses USB, with a custom cable that connects next to the headphone socket. Songs upload at a terrific rate, namely 380KB/s, so it takes only a minute and a half to fill the player's standard 32MB memory.

Power:

Single AA battery, 8 — 10 hours playback time quoted.
Off: 2mA (rather excessive)
Play: 180mA (High, but standard for modern players)

Radio:

Ha! There isn't one! The Rio 600 simply plays digital music, so there's none of that old-fashioned wireless stuff here.

Recording:

Err, there's no voice record function either, so you'll just have to take notes at your next meeting, won't you?

Memory:

The Rio 600 comes with a 32MB 'back' looking not unlike a battery back for a mobile phone. Want more RAM? Buy a new back, and throw out the old one. 64MB backs are available, and there are rumours of a 340MB Microdrive back, and even an optical disc back giving up to 500MB storage. Just hope and pray — It will happen.

DSP:

Well, there's (deep breath): Normal, Jazz, Rock, Classic, Book, Rap, Pop, Flat and Custom (Bass and Treble adjustable over a 0 - 9 range).

Headphones

These little alien devices are great if you have size N32 ears. If you don't (and let's face it, not many do), they are downright painful. They also take great delight in tangling at the drop of a hat, so the best place for them is either in your ears, or in the bin.

Software:

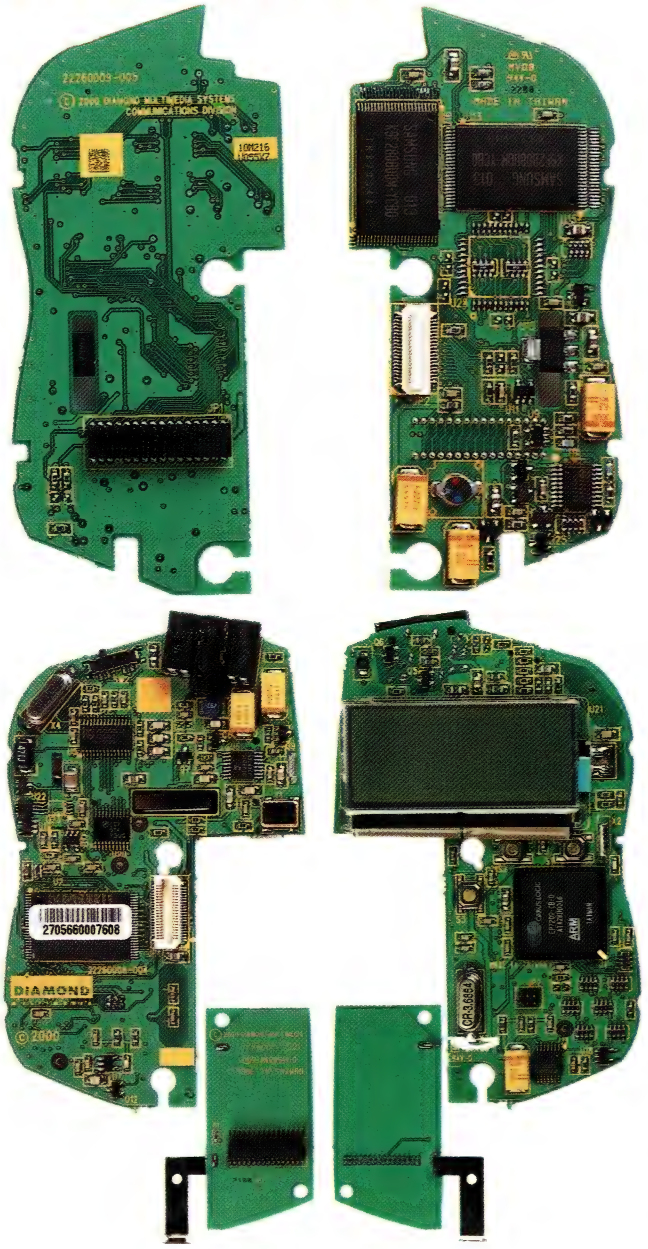
Oh my. The Rio 600 Audio Manager has to be seen to be believed. It must rate as one of the best applications for any player in existence. It's so good in fact, we use it as our default MP3 player. Well, at least for now...

Supported formats:

Good 'ol MP3 (Although we've been told not to call the Rio an MP3 player), and WindowsMedia (.WMA) playback are supported by the Rio 600 by default.

Price:	$399
Website:	www.rioport.com
Avaiable:	Leading retailers and department stores.
Physical:	100 x 65 x 25mm (ish, it's hard to be precise...)
We liked:	The great Rio Manager software The fact that is so simple to drive The fast song upload speed via USB
We didn't like:	The push fit back that didn't 'click' into place. The 32MB back shipped as standard - it should really have been 64MB...

WHAT'S INSIDE



Now, where did I put those screws?

Yes, we did it again. As soon as the Rio 600 arrived in the office, we had it pieces all over the desk. Sorry Rio, but it's in our nature.

In the Rio itself, there are the top two boards which plug together quite neatly via the white connector near the cutout. You can see the Cirrus Logic processor on the lower left board, but what's that on the lower left? Yup, it's 32MB of Flash RAM.

The bottom board from the Rio's back tells the full story – it's empty! That's right, the 32MB back for the Rio doesn't actually contain anything except the battery. With the 32MB of RAM in the player itself, the 32MB back contains nothing, the 64MB back has 32MB, and so on.

It makes sense if you think about it...

Sony's Widescreen

At last — an LCD video projector that will show '16:9 widescreen enhanced' DVD movies properly, and with a picture quality approaching that at your cinema. It's the new Sony VPL-VW10HT, and if you're a home theatre enthusiast it could well be the answer to your dreams... **By Jim Rowe**

UNTIL NOW IF you've wanted to watch movies from your DVD or laserdisc player, or from your VCR in 16:9 widescreen format, you've really had to use a widescreen CRT or rear-projection set. That's because virtually all of the LCD and DLP projectors have displayed a picture in the traditional 4:3 aspect ratio. As with ordinary TV sets, the only way they can display a 16:9 picture has been in the familiar 'letterbox' mode, with horizontal black strips above and below the picture.

All of which is unfortunate, because for decades now just about all movies have been made in a variety of widescreen formats. Watching them in letterbox mode certainly doesn't do them justice, because you're only using about 60% of the scanning lines and

Wonder

One of the very few widescreen projectors around at the moment, the Sony VPL-VW10HT gives you a true 16:9 display to get the most out of your movies.

pixels available to display a 4:3 TV picture — the rest are wasted in those black bars.

What makes this especially frustrating with DVDs is that many of the movie discs are actually encoded in anamorphic widescreen format (usually called '16:9 enhanced'), and if you wish, most DVD players can decode them in this format to suit a widescreen display device. This gives significantly better image quality, because many more of the video lines and pixels are actually put to use.

(You don't necessarily get to use ALL of the TV lines and pixels, because even 16:9 or 1.78:1 ratio isn't as wide as the formats used for many movies. Some movies have been filmed in 1.85:1 ratio, for example, while many others are in the even wider 2.35:1 ratio. But 1.78:1 is a lot closer to either of these than the 1.33:1 of a traditional 4:3 TV image. So even for 2.35:1 movies the black bars tend to be relatively narrow.)

One way and another, then, the arrival of a true widescreen LCD projector like the new Sony VPL-VW10HT is likely to be of great interest to home theatre enthusiasts. Especially as it offers rather more than just a 16:9 widescreen display...

But let's introduce it properly. The VPL-VW10HT is no lightweight midget; it's a fairly sturdy beast, measuring 395 x 427 x 168mm (WxDxH) and weighing in at 8kg. This reflects the fact that it's primarily made for use as a relatively fixed video projector, not as a 'presentation accessory' for laptop PCs.

To achieve that 16:9 widescreen display format it uses three special LCD panels, each measuring 34.3mm diagonally and with a resolution of 1366 x 768 pixels. That means they're essentially XGA panels, expanded horizontally by adding another 342 pixels to each horizontal row. This gives a true 'native' display resolution of 1,049,088 pixels per primary colour, or a total of 3.15 megapixels — more than enough to realise the full potential of DVD, and in fact quite capable of doing justice to digital HDTV. There's no anamorphic lens or other optical trickery.

The LCD panels use P-silicon thin-film transistors (TFTs) for pixel switching, by the way, so their response is fast enough to avoid any of the 'lag' and 'smear' sometimes visible on projectors using other types of LCD.

There's a high efficiency 200W UHP lamp pushing light through the LCDs, and this coupled with a fairly fast (f/2.2 - 2.5) zoom lens at the output end of the optical system results in the projector developing a light output of 1000 ANSI lumens for the complete 16:9 picture (750 lumens for the centre 4:3 section). A very healthy output, in other words, and enough to give a really bright image in most home theatre situations.

That projection lens has a zoom range of 1.2:1 (44.6 - 53.6mm), incidentally, so it also allows a reasonable amount of image size adjustment. Zoom and focus are both manual, but this is fine for a projector intended to be used mainly in a fixed location.

Another advantage of that relatively large case is that there's room for a fair amount of acoustic filtering to reduce noise from the cooling fan. So the VPL-VW10HT is commendably quiet in operation (very desirable in a home theatre projector), and in any case most of the residual noise emerges from that round ventilation 'port' next to the projection lens on the front of the projector, where it will be facing the screen and away from the audience.

So far, it all sounds very nice, and of course it is. But there's more. To ensure that you can use it to achieve the best possible image quality from a wide range of video material, Sony's designers have built in some pretty fancy digital image processing technology.

Perhaps the most impressive part of this technology is what Sony calls 'Digital Reality Creation Multifunction' (DRC-MF). This seems to perform what is essentially both line doubling and horizontal pixel interpolation, so it effectively doubles the video image resolution in both directions.

Coupled with DRC-MF they've also provided 3-D Gamma Correction, Cinema Black Mode (which automatically reduces the black level according to the source material and ambient lighting) and digital noise reduction.

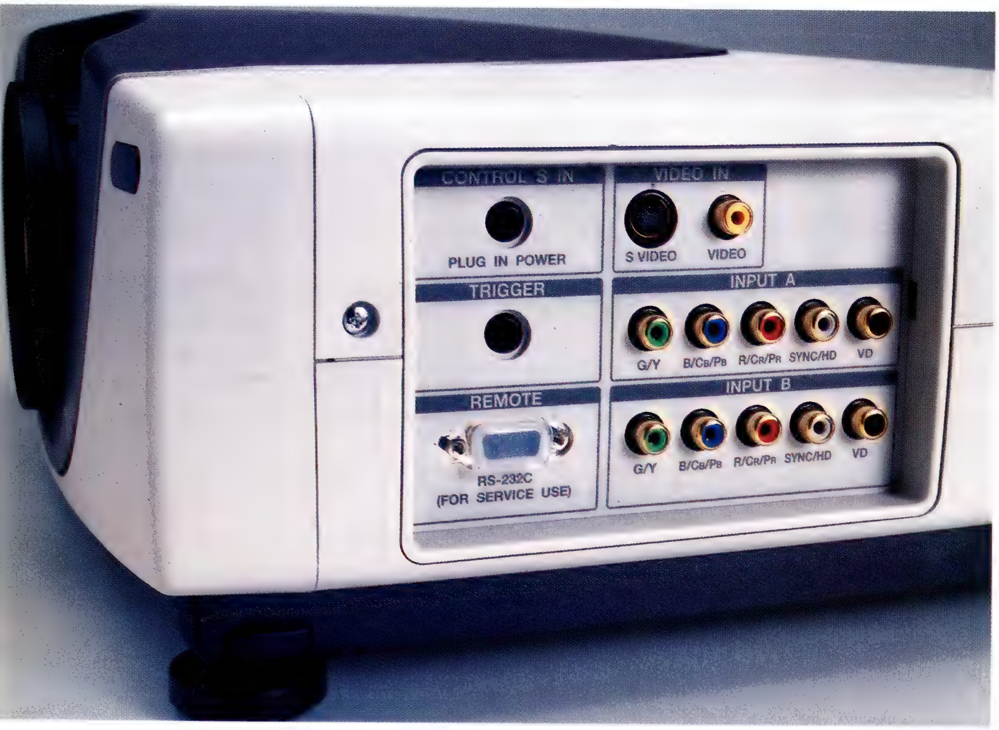
As if that wasn't enough, they've also given the projector a range of seven different image display processing modes, so that almost every type of video source material can be displayed to best advantage in the wide format.

For example FULL mode allows anamorphic ('16:9 enhanced') video to be displayed on the full 16:9 image area, while ZOOM mode allows the live image area of 'letterbox' video to be blown up to achieve a similar effect.

Here's a summary of all seven modes:

FULL: A squeezed 16:9 image is unsqueezed and then expanded in both directions (i.e., line and pixel doubling) to fit the entire screen. A 4:3 image looks stretched horizontally.

FULL THROUGH: One-to-one mapping is done on an unsqueezed 16:9 image, i.e., there's no line or pixel doubling. The widescreen image is displayed in the centre of the screen.



There are connectors for virtually every type of video and computer graphics input, on this panel at the left-hand side.

WHAT SONY CALL DRC-MF

NORMAL: A 4:3 image is displayed normally at full height in the centre of the screen, i.e., with line and pixel doubling.

NORMAL THROUGH: One-to-one mapping is done on a 4:3 image, with no line or pixel doubling. The image is displayed with normal aspect ratio in the centre of the screen.

ZOOM: A 4:3 image is line and pixel doubled, and also expanded in both directions so the centre panel corresponding to a 1.78:1 'letterbox' image is expanded to fill the screen.

SUBTITLE: Very similar to ZOOM, except that the lowest section of a 'letterbox' image is compressed vertically to ensure subtitles remain readable.

WIDE ZOOM: A 4:3 image is pixel doubled and expanded linearly in the horizontal direction to fill the 16:9 screen. It is also expanded vertically, but non-linearly so the highest and lowest sections are compressed. Intended to convert 4:3 TV images for

When the projector is used on a table, all functions can be controlled using the buttons on the top of the case.

EFFECTIVELY DOUBLES THE IMAGE RESOLUTION IN BOTH DIRECTIONS

acceptable widescreen viewing.

In short, just about every kind of currently available video signal can be displayed on the full 16:9 screen, and with either its native resolution or an enhanced version. Pretty impressive!

By the way, those display modes are basically intended for what we might call 'analog' video signals — i.e., with variations on a traditional interlaced PAL or NTSC video format. The projector is also capable of displaying progressive and interlaced-scan SDTV and HDTV signals, and processing these for optimum display...

As you might expect from this display capability, the VPL-VW10HT is designed to accept a very wide range of video and data input signals. For example it accepts any of the standard analog colour video formats (PAL, NTSC, Secam, NTSC4.43, PAL-M, PAL-N etc), and has inputs for composite video, S-video (Y/C), component video (RGB, Y/Cb/Cr or Y/Pb/Pr) and progressive component RGB.

With the ability to accept signals with vertical scanning rates from 50-85Hz and horizontal rates from 15-80kHz it will also handle a very wide range of computer graphics formats as well, of course. In fact there's a table in the manual showing a total of 49 different preset signal formats that can be processed, including the Japanese 'MUSE' analog HDTV signals and six different digital SDTV/HDTV formats. Whew!

I should also note that in the FULL, NORMAL and ZOOM display modes, the projector provides a digital keystone correction function. So if you need to tilt the projector up or down to line up the image on your screen, the resulting keystone distortion can be corrected relatively easily.

Like most projectors the optical axis of the VPL-VW10HT is already tilted up by about 15°, and optically corrected for this. So if the projector is mounted horizontally with its lens centre approximately level with the bottom of the screen, and the screen is vertical, there won't be any keystoning. The same applies if the projector is suspended from the ceiling using a special mounting bracket, level and lined up with the top of the screen.

Anther useful function is the projector's own built-in test pattern, available at the touch of a button. It's a fine white grid on black, and in the 16:9 format. This makes focussing and keystone correction very easy.

The projector comes with a remote control, which would be especially handy when it's suspended from the ceiling. Also supplied are a user manual, a lens cap, a power cord and a spare air filter.

cuitry in standby mode: the receiver draws only 1W in this mode, instead of the usual 5W or so.

Needless to say the D509 also includes a full surround sound configuration facility with pink noise 'test tone' signals, adjustable delay and channel gain, and so on. All this in a receiver measuring a tidy 420 x 401 x 158mm (WxDxH), weighing in at 8.4kg and available in either a black or gold case finish.

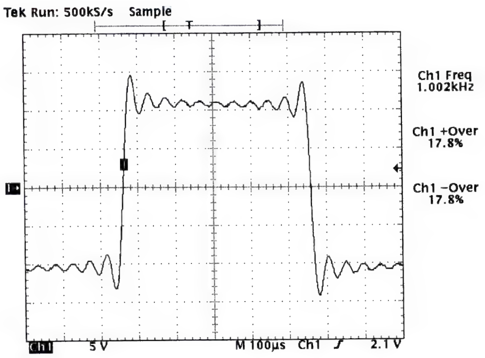
What we found

Pioneer Australia kindly whizzed us a sample of the VSX-D509S, so we had a chance to review it before this latest generation of models could become superseded.

First up we checked out its basic performance with the instruments, and the results were quite interesting.

With only the two main front channels driven, we were able to measure a very clean 85.3W RMS per channel continuous into our standard 8-ohm loads, just before any sign of clipping. This rose only a tad to 88W/channel with the IHF tone-burst test, showing the power supply has only a modicum of headroom.

With all five channels driven (using the 5.1-channel inputs), the continuous output before clipping fell to just over 50W RMS per channel. However this rose to 62W/channel with the IHF tone-burst signal, suggesting that for typical surround sound movie tracks it would be reasonable to think of the D509 as having an effective output of about 60W/channel. Which is not as much 'grunt' as the VSX-508 receiver model it more-or-less replaces, but still quite respectable, especially in a below-$1000 receiver.

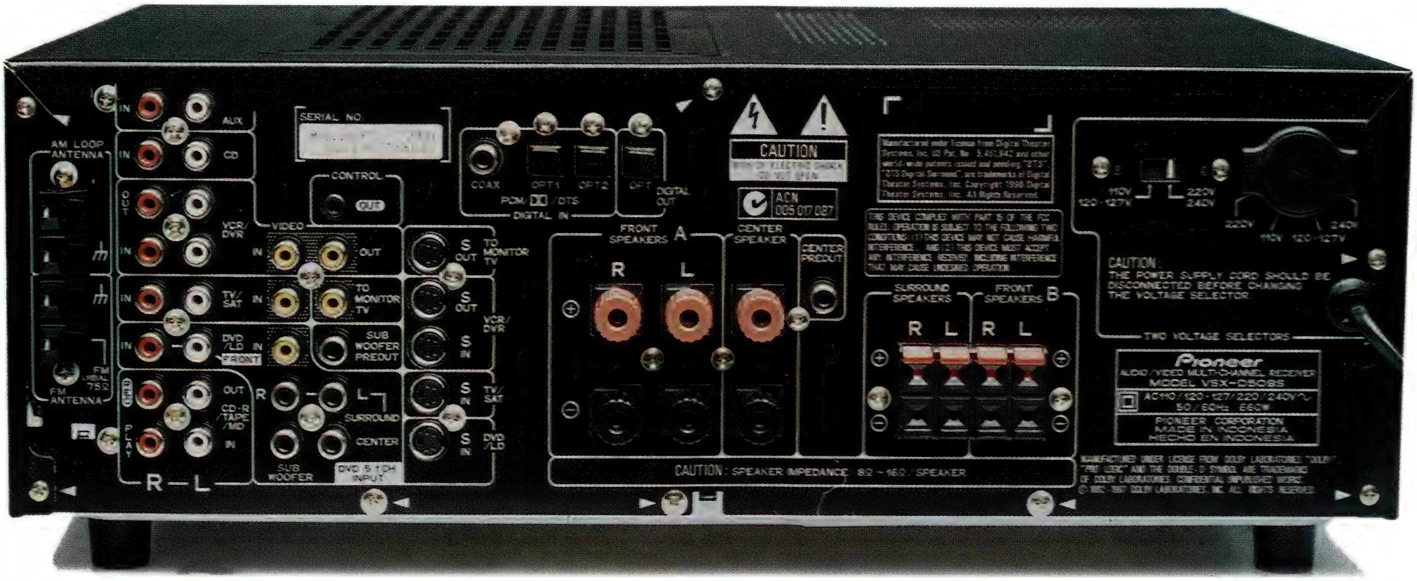


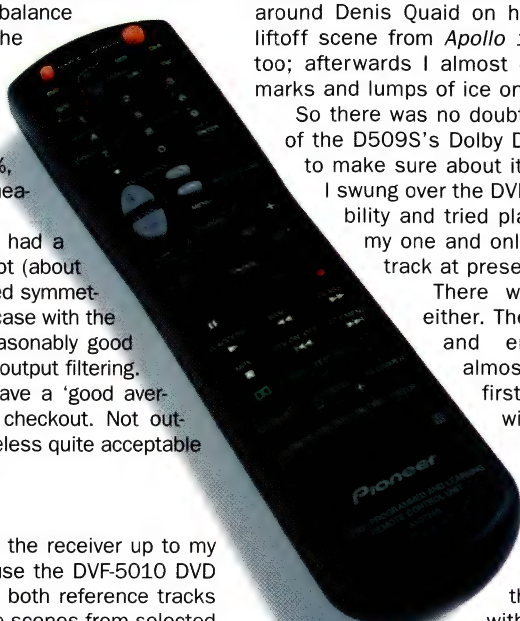
The square wave *response has a reasonable amount of overshoot, but the ringing is symmetrical and well damped – a 'good average' result.*

The analog frequency response in CD direct mode and right through to the output dummy loads measured from 3.5Hz to 83kHz within +0dB/-3dB, and was only 0.2dB down at the 20Hz and 20kHz points. The signal to noise ratio below 20kHz was over 87dB, and the channel crosstalk at full output measured better than -71dB. All of which is fine, albeit unexceptional.

Next I checked the performance using the coaxial digital input, using a bitstream signal from my Kenwood DVF-5010 DVD player and

Inside the case *it's all neatly laid out, with a large finned heatsink for the hybrid power amps. The radio tuners are on the small PC board behind the heatsink, visible here in the top corner.*





some of our standard test CDs. Again measuring at the speaker outputs with dummy loads connected, the basic response from 20Hz to 20kHz measured within +0dB/-0.6dB, with channel balance better than +/-0.2dB. The decoder DAC linearity was good down to about -86dB, while the dynamic range measured just over 91dB. Similarly the THD at 1kHz measured 0.02%, and was below 0.13% at all measured frequencies.

The square wave response had a reasonable amount of overshoot (about 18%), but with fairly well damped symmetrical ringing. This was also the case with the impulse response, showing reasonably good phase linearity in the anti-alias output filtering.

Overall, then, the D509S gave a 'good average' result in the instrument checkout. Not outstanding, perhaps, but nevertheless quite acceptable in a receiver at this price level.

Listening tests

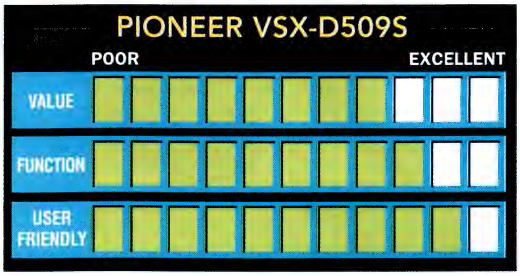
The final checks were to hook the receiver up to my home theatre speakers, and use the DVF-5010 DVD player to try it out aurally with both reference tracks from music CDs and also demo scenes from selected movie DVDs. This was using the receiver's coaxial S-P/DIF input, and after performing the usual surround channel configuration and setup — which proved to be very quick and straightforward, I should add.

Using the CDs, I found the sound field from the D509S very clean and balanced. This was both in 'Direct' mode, giving a standard stereo sound image (which was very stable), and also in Dolby Pro-Logic mode — which gave a smoothly expanded surround field, with excellent 'presence' on many of the tracks.

Not surprisingly the performance was even more impressive playing some of the movie DVD demo scenes, with their Dolby Digital and DTS surround tracks. For example in chapter 2 of *Armageddon*, the asteroids whizzed past you very realistically on their way down into New York; similarly in chapter 12 of *Dragonheart*, Draco's wing flapping clearly moved around the room as he flies around Denis Quaid on his horse. That dramatic liftoff scene from *Apollo 13* was very convincing, too; afterwards I almost expected to see scorch marks and lumps of ice on the carpet!

So there was no doubt about the performance of the D509S's Dolby Digital decoding. But just to make sure about its DTS decoding as well, I swung over the DVF-5010 to Region 1 capability and tried playing a few scenes from my one and only DVD movie with a DTS track at present: *Dances With Wolves*. There were no problems here either. The sound was clean, wide and enveloping; you could almost smell the blood in the first-aid tent, and feel the wind in your hair out on the prairie.

My overall impression is that the Pioneer VSX-D509 provides enough power output capability for most home theatre setups, together with a level of decoding flexibility and performance which should be sufficient to satisfy the majority of users. All at a price which should make it pretty appealing, too. ea



SUMMARY

- A five-channel home theatre receiver with a nominal output rating of 100W per channel.

KEY FEATURES

- Dolby Digital, Dolby Pro-Logic and DTS decoding
- S-video and composite video switching as well as audio
- Coaxial bitstream output for digital audio recording
- Multi-function remote control with 'learning' capability
- Binding post speaker terminals for three front channels

RRP

- $999

AVAILABLE

- Pioneer AV dealers, or contact Pioneer Electronics Australia on 1800 338 439.

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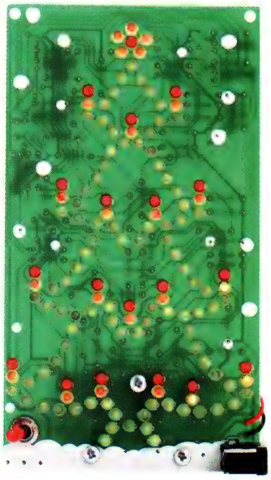


velleman·kit HIGH-Q

Deluxe Christmas Tree Mini Kit

This colourful Christmas tree consists of 134 LEDs, with 18 of these LEDs acting as randomly blinking candles. Supplied with pre-cut circuit board, flashing LEDs and all required components.

K 1335

$32.57

velleman·kit HIGH-Q

Riding Santa Mini Kit

This great kit is supplied with a pre-cut circuit board, 126 multicoloured flashing LEDs, and required components. Some soldering experience is required.

K 1321

$32.57

velleman·kit HIGH-Q

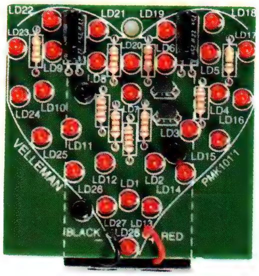
Christmas Tree Mini Kit

Make your own Christmas tree with a tree-shaped PCB and flashing LEDs. Supplied with pre-cut circuit board, flashing LEDs and required components.

K 1309

SAVE $5.43

$14.80



velleman·kit HIGH-Q

Sweetheart Mini Kit

Supplied with pre-cut circuit board, 28 LEDs and required components to form two blinking hearts. 9 Volt battery required (not included).

K 1322

$12.89

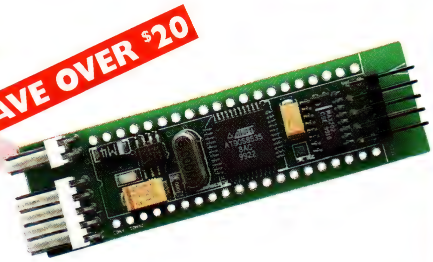
Hot Chip Mini Board

Chip and board only.

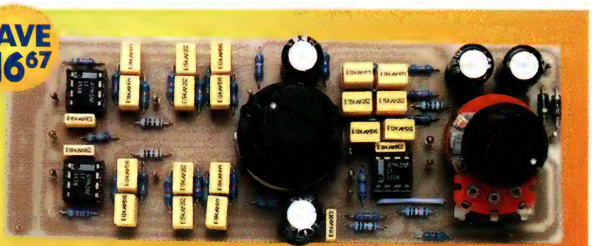
K 1431

$69

SAVE OVER $20



SAVE $16.67



Subwoofer Crossover Kit

Allows you to integrate a subwoofer with an existing speaker system. Offers both low-pass and high-pass outputs which have matching roll-off and phase characteristics. Supplied with PCB, components, knobs and sockets.

K 5404

$20

Digital Voltmeter Kit

This handy digital voltmeter will help keep tabs on the condition of your car's battery and charging system. Features a three-digit LED display with automatic dimming.

K 4209

$43.16

Audio/Video Generator Kit

SAVE $10

This handy test generator produces a standard monochrome video signal with a four-step greyscale pattern, as well as a 500Hz audio tone. Comes with PCB and components only.

K 7341

$14.16

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Messing with mobiles

There's more to customising a mobile phone to your personal needs than just clipping on a $15 plastic cover. With the right hardware you can explore the electronic depths of your mobile, and tap into a weird and wonderful world of hidden functions - all of which can be setup and exploited for your own selfish ends. **Rob Evans** has discovered a new digital playground.

Whether you regard a mobile phone as a necessary evil, the salvation of your business, or just a boon to your social life, those ever-shrinking technological marvels are here to stay. They're packed with more sophisticated electronics than most of us are aware though, and some would argue, like our brains, have more capability than we will ever use.

A dubious analogy perhaps, but the current crop of mobile phones have a host of communications features and extra functions that are rarely tapped by the average user. You don't access them by paying additional fees to your phone service provider, or even via special key combinations on the phone itself. Instead, all those natty features become available when you connect a special data communications cable between your phone's accessory socket and a PC's serial port.

Unfortunately, there's no real connection standard used by phone manufactures for this accessory socket, so a general-purpose cable to suit all phones isn't possible. Instead you need to track down the correct cable for your particular phone, which can end up being a frustrating and potentially expensive exercise.

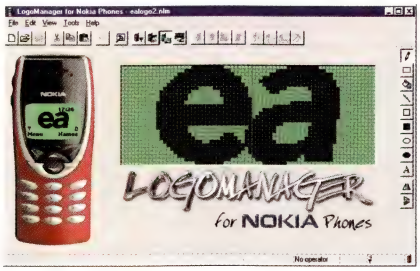
Thanks to the huge popularity of Nokia phones though, reasonably-priced data cables have begun to appear to suit their most widely sold models. We were keen to try one out, and Sydney-based mobile phone specialists Frenetic came to the party by sending us a data cable that's compatible with Nokia models 5110, 6110, 6150 and 7110.

There's not much you can really say about a data cable, of course. It's about a metre long, has molded plugs, seems solidly built, and is priced at $55 — end of story. Beyond that though, it's all about what you can *do* with the cable, and this in turn depends on the extra functions available in the phone and the capabilities of the PC software used to communicate with it.

As it turns out, there's a enormous range of PC software available for doing this job, so we attempted to cut the middle ground by trying out one of the most popular software packages (Logomanager) with a very common phone (a Nokia 5110). We had fun...

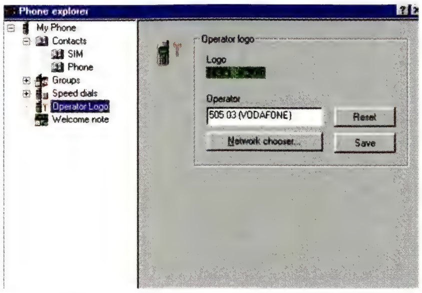
Logomanager + Nokia 5110

So what can you do with a 5110 connected to a PC running Logomanager? Put simply, quite a lot, although the value of the phone's unearthed functions range from very useful to arguably frivolous.


LogoManager for Nokia Phones - ealogo2.nlm
File Edit View Tools Help
ea
LOGOMANAGER
for NOKIA Phones
No operator

Here's a rundown on the features and configuration editing that can be done with Logomanger. Although a number of other programs are capable of these jobs, we'd have to say that not many of them are as intuitive to drive as Logomanager.

Update/change screen graphics: There are several types here, and what's available depends on your phones capabilities. With the Nokia 5110, you can only edit or replace the so-called Operator logo.



Operator
505 03 (VODAFONE)

- Operator logos — the graphic that appears when you're logged on to a phone company's network (Telstra, Vodafone, etc).
- Group logos — icon that's displayed when someone from one of your 'caller group' phones (family, business, pests, etc)
- Startup logo — the welcome message/graphic shown when you turn on your phone.
- Picture messages — graphics/logos that can be sent via the Simple Message Service (SMS), just like text messages.

Update and send ring tones files: The proprietary character-based format for Nokia ring tones is stored in the phone's memory, and can be edited or replaced.

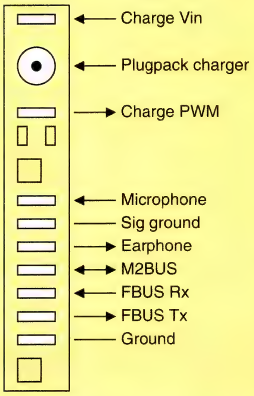
Anatomy of a phone connector

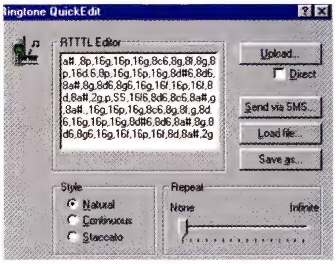
The diagram here shows the I/O connector of a typical mobile phone, in this case the very popular Nokia 5110. This phone has been on the market for some time and doesn't offer all of the data/configuration features of some of the later models (such as ring tone programming), but most of the basic functions are available.

Basically, the lower half of the connector deals with the data and audio interface, while the upper section involves the charging connections. The phone battery can be charged from a smart charger, where the input voltage is applied at pin 1, and pulse width modulation (PWM) control appears at pin 2. Between these pins is a standard socket for the conventional plugpack-style charger supplied with the phone.

In the audio/data I/O section of the connector, pins 3, 4 and 5 are used for hands-free adaptors and car kits, with the microphone input (up to 1V) at pin 3 and the earphone output (again, rated up to 1V) appearing at pin 5. The all-important data bus systems appear at pin 6 (MBUS) plus pins 7 and 8 (FBUS).

It's important to note that both buses are essentially 3V systems, so the (nominal) +/-12V swing from a PC's RS-232 port is quite unsuitable — this is where the electronics inside a compatible data cable comes into play. For an FBUS cable, the circuitry molded into the cable connector essentially acts a buffer and level converter between the bipolar RS-232 signals (+/-12V) and those at the single-ended phone port (+3V).





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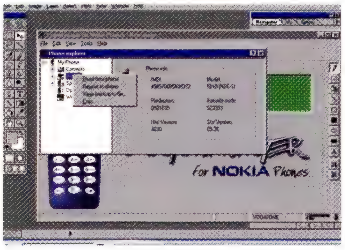
a#.,8p,16g,16p,16g,8c6,8g,8f,8g,8
p,16d.6,8p,16g,16p,16g,8d#6,8d6,
8a#,8g,8d6,8g6,16g,16f,16p,16f,8
d,8a#,2g,p,S5,16f6,8d6,8c6,8a#,g
,8a#.,16g,16p,16g,8c6,8g,8f,g,8d.
6,16g,16p,16g,8d#6,8d6,8a#,8g,8
d6,8g6,16g,16f,16p,16f,8d,8a#,2g
```

Style: ● Natural ○ Continuous ○ Staccato

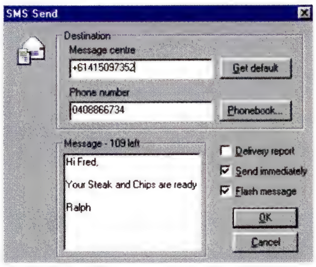
☐ Direct

Want your favourite heavy-metal guitar riff as your ring tone? No problem, as long as you know the notes... This feature is not available on the 5110, by the way.

Backup and edit your phone book: This is perhaps one of the most practical and valuable features of Logomanager. Once the link is established with phone, Logomanager can back up your complete phone list, including the one-touch settings and other data, to the PC's hard disk. It's a very useful archive feature, and means that if your phone is stolen (heaven forbid) then all your important contact numbers won't be lost along with the SIM card.



Read and write SMS message on your PC: If you've sent text (SMS) messages via your phone, you'll know how much of a pain it is to 'type' in the message via the phone's keypad. Banging out a message on your PC's keyboard is infinitely easier, and the result is instantly sent via your phone when you hit the send button. Email is easier of course, but it won't reach a remote mobile phone without a dedicated (and potentially expensive) mobile/email gateway service — then again, the typical charge for an SMS messages is a whopping 20 cents in Australia...



Message centre: +61415097352

Phone number: 0408866734

Message - 109 left:

Hi Fred,

Your Steak and Chips are ready

Ralph

☐ Delivery report
☑ Send immediately
☑ Flash message

Access the Network Monitor features on you phone: This perhaps goes under the heading of risky business, but there's a bewildering array of high-level phone and network functions available via Logomanager's Network monitor feature. Here, you can gain access to quite detailed technical information on the state of network and the phone itself, and reconfigure your phone in dastardly ways. It's not for the faint-hearted, as there's the potential here to render your phone useless by engaging a crippling service or configuration option. The phone will apparently clear these options when reset...

There's more functions, too, and it's not hard to while away the hours playing with your phone via the PC. Logomanager is quite well documented via the on-line help system, and you soon find yourself

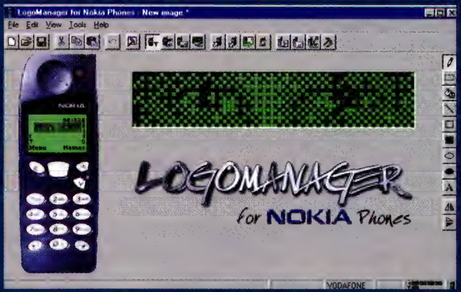
Image fun

While countless Nokia phone graphics can be downloaded from the internet, it's very easy to create your own. Playing around with your phone graphics might sound trivial, but you can put a truly personal stamp on the way it looks by creating your own image on the screen. It might be your company logo, a particularly pertinent insult, or perhaps a graphic extracted from a scanned photograph or digital camera image file.

To cook up your own graphics or logo, you'll need to create a *monochrome* image file of the correct dimension to match your phone's screen.

Let's say you have a particularly fetching portrait of your mum, and you'd like her eyes to look out from your phone — just to keep you on the straight an narrow. First, pull the image file into your favorite image processing software (Photoshop, Paintshop Pro, etc), convert it into a bitmap (monochrome) format, then crop the picture around the eyes.

Chances are that the image is much too large at this stage, so use the program's scaling or resampling function to reduce the image size to the correct number of vertical pixels. If you are creating a operator logo for a Nokia 5110 for example, this would be just 14 pixels high — you'll also need to expand or contract the image to be 72 pixels wide, without distorting the image. Later model phones tend to offer higher resolution graphics, by the way, with the Nokia 3120 for example featuring a 48 x 84 pixel startup graphic.


LogoManager for Nokia Phones - New image
File Edit View Tools Help
LOGOMANAGER
for NOKIA Phones
VODAFONE

Next, save the processed image as a Windows bitmap file (.BMP), and just open that file in Logomanager. The eyes will magically appear on the sample phone's screen in Logomanager, and the file can then be saved in the program's .NLM format then uploaded to the phone. When the phone then logs onto the operator network, mother's eyes will appear on the screen instead of the usual Telstra (or equivalent operator) logo — terrific.

SUMMARY

- A 'smart' data cable that lets PCs communicate with Nokia mobiles.

KEY FEATURES

- Uses a standard PC serial port.
- Suits many Nokias

PROS

- Heaps of suitable software around.
- Useful, and fun.

CONS

- Reckless use of software could scramble your phone's brain.

PRICE

- $55

AVAILABLE

- Frenetic. Go to www.frenetic.com.au

On the bus

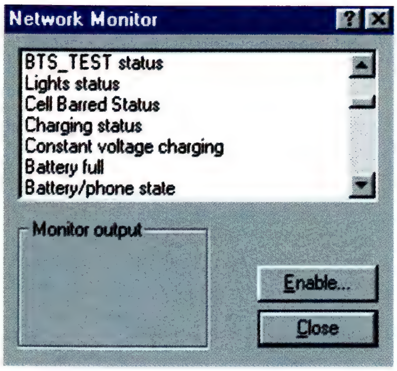
FBUS, M2BUS, what's it all about, then?

Most Nokia mobile phones have these two quite different data/control bus systems, however either can be used to access the phone's control and data exchange functions via a PC's serial port. The relatively slow MBUS port was the first to be included on Nokia phones, so their own servicing and configuration software tends to use this system. However to satisfy the demand for faster and more elaborate communications with a PC, Nokia introduced the more advanced FBUS setup — the data connection of choice for most Nokia-compatible phone-to-PC programs.

Dual-mode (FBUS and M2BUS) cables are also possible though. It might be rather pricey, but Nokia's own 'Cellular Data Suite' package does include their DAU-9P cable, along with the software. This is a link cable that can talk to both type of data buses, so the DAU-9P can be used with all of the popular data link programs *plus* the more invasive configuration and servicing functions available in packages such as WinTesla, and Nokia's own servicing software. Most of these advanced features can only be accessed via the M2BUS, by the way, so the risk of scrambling your phone's brain is rather less when using a data cable that can only talk to the FBUS.

On the technical side, the two buses are really quite different. For a start, the MBUS standard is limited to a data rate of 9600 bps, while the FBUS can apparently cope with rates of up to 230K bps. This is well beyond the 115K bps maximum rate from a PC's serial port, so FBUS-based programs can communicate with the phone without noticeable delays.

The other major difference is the interface itself, as the M2BUS uses a rather odd half-duplex setup through just one connector pin (see phone connector diagram), while the FBUS is based on a more conventional full-duplex setup with separate transmit (Tx) and receive (Rx) lines — again, this adds up to a more transparent connection in both directions.


Network Monitor

BTS_TEST status
Lights status
Cell Barred Status
Charging status
Constant voltage charging
Battery full
Battery/phone state

Monitor output

happily probing away in your phone's internals - so to speak.

The trial version of Logomanager is free and can be downloaded from the internet for evaluation purposes (**http://www.logomanager.co.uk**), but some features are disabled and the word 'demo' is overlaid on graphics/logo image — this is also how the image will appear on the phone's screen. Users are encouraged to register this version of Logomanager by paying fee, where they will be sent an 'unlock' key to enable the fully functioning version.

If price is not an issue, you could always opt for Nokia's own Data Suite package. Promoted as a serious 'office information system', as opposed to the 'fun with your mobile' approach taken by most share/free -ware offerings, the Nokia Data Suite has a generous range of useful functions. These include the graphics, phone book, SMS and ringtone editing found in other packages, plus the ability to send and receive faxes, and access the internet — albeit at a snails-pace of 9600bps.

Of course, regardless of which software you choose or just want to try out, you'll need a data cable that suits your phone. Frenetic (**www.frenetic.com.au**) can supply 'smart' cables to suit a wide range of Nokia phones, including the 3210 ($55), 8210 and 8850 (both $65), along with the 5110/6110/6150/7100 type we've looked at here. **ea**

FUNCTION COMPATIBILITY (NOKIA)

Model	Connection	Startup	Operator	Group	Ringtones
3210	Cable	Yes	Yes	-	Yes
5110	Cable	-	Yes	-	-
5180	-	-	-	-	-
5190	Cable	-	V5.81	-	V5.81
6110	Cbl/IR	Yes	Yes	Yes	Yes

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Flight sims:
VIRTUAL V

A few days ago I went out to Hobart's Cambridge Airport, hopped into a Cessna 182, took off and headed west toward the city, passing Mt. Rumney on the way and flying over the Tasman Bridge. I then angled off toward the Cenotaph and headed along the Huon Highway, passing my former home in Fern Tree on Mt. Wellington. Then I headed south over Cygnet, and on past our beach house at Abels Bay where I turned off to Bruny Island for a pass over the Duck Pond, a favourite yachtie hangout. And last, a descent over Seven Mile Beach brought me in for a landing at Hobart's main municipal airport.

By Tom Moffat

THIS LITTLE visit back to Tassie made me damned homesick, to say the least. Especially since I didn't even leave my desk in Port Townsend, USA. The whole trip was made on the screen of my laptop computer, running one of the Microsoft Flight Simulators. Tasmania didn't exist in the original version, but I was able to download from the internet, 'scenery' for the whole island plus a large collection of airports.

The landscape was based on topographic maps of Tassie, so the coastline was very accurate. I've flown over a good part of it before in real Cessnas, and paddled much of the coast in a kayak. So I didn't need any navigation instruments, just my eyeballs and a knowledge of the area gained through living there for twenty years.

That flight simulator was Version 5.1, released in 1995. The later versions keep getting better and better (and bigger and bigger - the latest Microsoft FlightSim 2000 is two thousand times the size of FlightSim 4, a version I still use).

10 years old, and still flying

I first wrote about flight simulators for EA almost ten years ago to the day. Back then the software was not nearly as sophisticated as today's, but pure magic nevertheless. As to the question about learning to fly, the answer was no, the flight simulator couldn't teach you, but it could let you practice what you already knew. Current flight simulators have structured lesson plans, which in the case of the Sierra simulator, was prepared with the help of the National Association of Flight Instructors in the USA.

s REALITY

To prepare this article, I purchased three flight simulators, mostly dirt cheap since they were not the latest models. I had to bypass the latest Microsoft release, FlightSim 2000, since there was no way it would fit in my year-old laptop computer. This whopper wants 1.5GB for the normal install, which is 3/4 of my total hard disk space. It also wants at least 128MB of RAM and a 300MB swap file on the hard disk. My poor little laptop would have busted a gut!

Game to fly

From a technology standpoint, a flight simulator is like a complex computer game. You must get lots of graphics onto the screen, and then make it all move together in real time. PC BIOS and DOS services are way too slow for this, so the only solution is to access screen memory directly. This is generally considered a no-no, because it doesn't follow 'standards' and software so written may not run on all computers. In fact, back in the early PC days, 'IBM-compatible' was pretty much defined as the ability to run Microsoft Flight Simulator.

Earlier flight simulators, such as FlightSim 3 which I wrote about ten years ago, ran under MS-DOS. This made access to screen memory dead easy, especially if the routines were written in machine code so you could just slam a byte of graphics right into the graphics card.

Version 4 and Version 5 were also MS-DOS based, but then it was decided that all future software must run under Windows, where direct access to any hardware is forbidden. Windows is fine for stationary graphics, but for moving graphics... yuck! So Microsoft came up with a system called DirectX which, through some system calls, allowed 'almost' direct hardware access to once again produce reasonable speed. In other words, Microsoft had to develop a solution that would allow Windows programs to run almost as well as DOS programs from earlier years. Is this a step backward, or what?

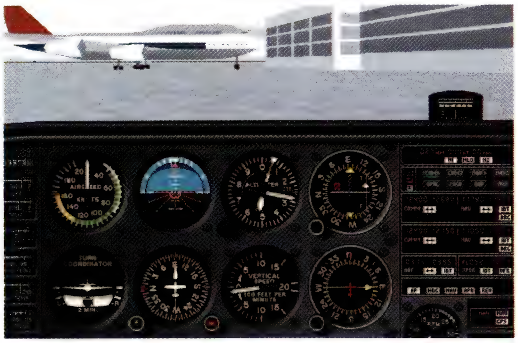
As with most software, users are encouraged to upgrade to later and later versions of DirectX, which is freely downloadable from Microsoft. And I almost took the plunge for DirectX version 7.0a until I read this warning:

"NOTICE: After installation, the DirectX 7.0a run time cannot be uninstalled because it changes core components and makes numerous registry changes within your operating system."

In other words, if the latest DirectX doesn't work in your system, you get to reinstall Windows. No thanks. I'm staying with DirectX version 5 that came with the Sierra flight simulator. As the Mortein man says, if you're on a good thing, stick to it!

Coffee, tea — or guided missile?

In the past few years, the flight simulator scene has split into two distinct paths, military and civilian, and seldom does the same pilot partake of both. The military sims feature hot aircraft engaged in battle to the death; the ultimate shoot-em-up. Civilian sims use more sedate planes, if you can call a Learjet sedate. The thrust (pardon the pun) is toward safe and precise flying, and learning and practicing navigation. So the planes have full avionics systems, working in partnership with navaids on the ground. Here we'll stick with civilian sims, mostly because I haven't had a chance to



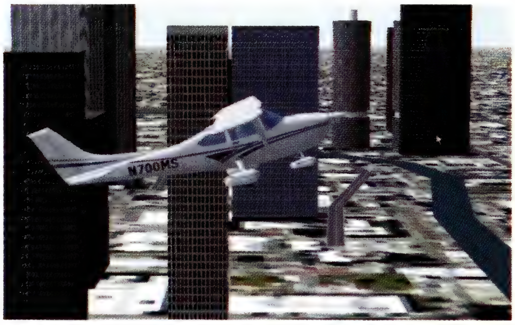
try the military versions.

I am a trained pilot of real aircraft, at least the Cessna 150 and 172 models, so I have a fair idea what to expect. Some sims are so close to the real thing it's uncanny; others are a little more slack. It's interesting that flying the planes from the earliest to the latest simulator versions is much the same. What changes is the quality of the scenery you see on the ground, and the sophistication of the avionics.

FlightSim through the ages

My copy of Microsoft's FlightSim version 3 appears to have slipped away through the annals of time. My only record of it is the article I wrote ten years ago. It contained a choice of at least three aircraft - a Cessna, a Learjet, and a Sopwith Camel of the type flown by Snoopy. I remember the Cessna was hard to control under full throttle, and the Learjet was very difficult to control at all. Looking back on it, that might have been caused by an absolutely awful joystick I owned at the time. It was originally made for a Commodore 64 computer and modified to fit the PC.

When FlightSim 4 came along, I was appalled that it took up almost a whole floppy disk (700k). This is back in the days when we used to fight over every byte.



The extra disk space was needed mostly for enhanced graphics, and the addition of another aircraft, a Schweizer sailplane. I have FS4 running nicely on two computers, an elderly 486 with 8 MB ram, and a Toshiba 486SX laptop.

Just for fun I also managed to squeeze FS4 onto a Hewlett-Packard HP200 palmtop computer running MS-DOS. Available memory in this machine is only 1MB, so the only place for programs to run is in the 640K of DOS conventional memory. This is indeed a struggle, and the palmtop crashes regularly trying to run FS4. But it's an interesting experiment, just to see what you can get away with.

FlightSim version 5.1 is the last and the greatest of the Microsoft DOS- based flight simulators. The disk requirement has grown to 17MB, and it needs its CD-ROM plugged into its drive as well - although I suspect that requirement is more to prevent software piracy than anything else.

FS51 was made back in 1995 when a 75MHz Pentium was a fast computer. The program offers options to minimize graphics usage and refresh rates to provide acceptable performance for a given computer speed. But if you set up the program to minimize graphics performance, and then run it on a faster computer, such as my 233MHz laptop, the program goes nuts. It just wasn't designed with these clock speeds in mind, and I suspect some timing registers in the software are overflowing and going around a second time. The result is something like a Cessna that does 600 knots, totally uncontrollable.

Fancy Fix

The solution to this dilemma is to turn on every conceivable graphics and refresh function to eat up that extra speed. The result is a very snappy flight simulator with absolutely stunning graphics. The Windows-based flight sims tend to pause and take a deep breath from time to time, but FS51 on a moderate speed Pentium runs smooth as glass.

FS51 comes with the same four aircraft as its predecessors, but it also allows you to install extra planes from files downloaded from the internet. In other words, it's open-architecture. So my version of FS51 also includes a Cessna 150 (the plane I learned to fly in), a Glassair which is a hopped-up Cessna with a 300 horsepower engine, an Alitalia DC-9, and a Southwest Airlines 737.

Southwest is probably America's most successful airline at the moment, so that plane is well known, even with its yucky colour scheme. They offer an excellent safety record, nice cheap fares, and hosties who

Learn to fly — on your PC!

You cannot officially count time with a home-computer flight simulator as loggable flight time. However you can use the simulator intelligently to save paying for instruction time later, by giving yourself a pre-lesson lesson. For instance: Lets say that your instructor tells you: "in tomorrow's lesson we are going to study slow flight".

Slow flight means getting the aircraft into a configuration where it is flying close to the minimum controllable airspeed, very near the edge of a stall. The plane feels very sloppy, 'mushing' along through the air. It takes a lot of control movement to make the aircraft do what you want it to. The idea is to learn to recognize and correct for conditions could lead to a stall — falling out of the air, which is disastrous if done at low altitudes.

In the flight sim you might find a special lesson on slow flight. After you have absorbed the lesson, you can go off and practice slow flight on your own. You can spend plenty of time, since on the computer it doesn't cost you anything. Some flying schools are installing computer labs for this very purpose.

The next day you and your instructor fly off to the training area to practice slow flight. But now he doesn't have to waste time showing you what to do — you've already learned that. So you can immediately start practicing slow flight as your instructor coaches you along. If you prepare for every

will sing to you over the PA if you're stuck in a holding pattern. In fact, during a recent Southwest flight, a hostie came up to me and asked "would you like me to find a pretty girl to sit next to you?" I replied, "Sure!". And the hostie said "well here I am!" and plopped down in the vacant seat. This kind of behaviour is officially encouraged. Yes, it's a fine airline...

Back to business: There are heaps of downloadable planes for FS51, but be warned that many of them need a program called Flight Shop in order to work. A few planes have overcome this requirement somehow, including the two jetliners in my program.

I wonder how accurate these simulations are. I managed to get the DC-9 into the air from the 3000 foot runway at Port Townsend, which was somewhat surprising. Admittedly I sat there on the runway with the brakes held on, revving the DC-9 until it was shaking and quivering like it was going to fly apart. When I turned it loose it got airborne just before running off the end of the runway.

As for the 737, you might have read a recent Moffat's Madhouse column about 737's crashing due to the rudder accidentally kicking hard over in one direction. At slow speeds the ailerons didn't have enough authority to overcome the rudder-induced roll, and the planes spun into the ground. I tried this on the Southwest 737 and the plane continued to limp along as I reduced speed, with the rudder hardover one way and the ailerons hardover the other. This suggests the simulated ailerons are a lot more powerful than the real thing on a 737.

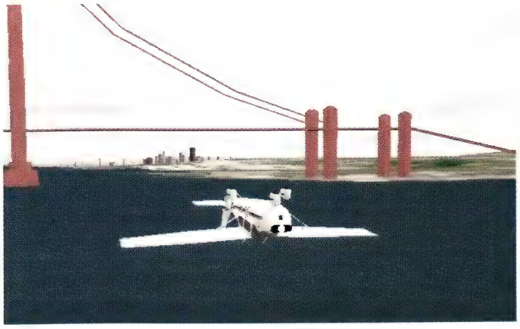
You can also download new locations, or 'scenery', for FS51. So far I have installed a detailed Albuquerque, the town where I grew up, a detailed Melbourne airport, the whole state of Tasmania, and the McMurdo area of Antarctica.

Flight Simulator 98 is a Windows program, running with the help of DirectX. It's very similar in performance to FS51 but with more features and planes. As well as the usual Cessna there is a plane called the Extra 300S, which I suspect is a 300 horsepower performance machine similar to the Glassair mentioned above. The Learjet has been upgraded to a very sleek Model 45, and also new is a Bell 206b JetRanger, a very popular helicopter in Australia, and a Boeing 737-400.

Once again I tried the rudder hardover test performed earlier on the Southwest 737 under FS51. Under normal circumstances the ailerons on this new 737-400 feel very sluggish, and with a rudder hardover the ailerons can't cope at all and a crash soon results.

As with FS51, you can download new airplanes and scenery from the internet. You can use planes designed for FS51 and run them through a freeware converter program for FS98. In this case, software like Flight Shop is not needed; the planes run immediately.

With FS98 comes 3-D graphics acceleration and MMX processor graphics enhancements. I haven't been able to assess the 3-D feature because I don't have the special graphics card needed. The graphics look fairly 3-D anyhow, although what are supposed to be puffy clouds tend to come out as enormous white cubes. It's no big deal. This flight simulator, being superseded, cost just $9.00 from Amazon.com. It comes with only minimal instructions. You're expected to purchase the full book separately for another $17.



ProPilot

There are several non-Microsoft flight simulators on the market, with Sierra Pro Pilot 99 being a fine example. The overall look and feel of this sim is silky-smooth. This sim treats sounds as carefully as graphics, and the program starts talking as soon as it's loaded: "You're cleared for takeoff!". The aircraft sounds are particularly good. When you start up the Cessna 182 it

lesson in this way, using your flight simulator, you'd very possibly double the value of each real in-air lesson.

Although fully trained, I haven't flown for a long time. Back on the flight simulator, I notice I've developed some bad habits, such as not lining up properly for landings, and ham-fisted use of the controls. So lately I've been doing circuits and bumps, round and round, until I get a nice landing approach every time. I'm much better now. The cost — zilch!

Pedal power

Unless you've spent a lot of money on special joysticks, one thing will be missing from your computer flying experience: use of the rudder to produce coordinated turns. Most joystick flight controllers don't have foot pedals, although you can buy them as add-ons. So you set your flight simulator for 'auto-coordination' and let the rudder movements occur automatically. If your instructor knows you're using a flight sim with auto- coordination, he'll give you extra emphasis on rudder control during your live flights.

Most of the later-model flight sims also have teaching modes. PP99 has a series of videos which show what's being taught from both within and outside the plane. FS51 guides you through lessons as you look out from the cockpit. FS98 has a full-blown Flight School, complete with an online aviation library with more than 200,000 words of text. That's the size of a complete novel!

MOFFAT'S **MADHOUSE**

BY TOM MOFFAT

Down with the progress! Bah!

I'LL BET that headline woke you up. Here he goes again, living in the past. But hear me out — maybe, at the end of this, you'll agree. First a technical matter of an automotive nature, rather than electronic.

I own a car with cruise control. It's a fifteen year old Volvo station wagon. I never would have bought the cruise control myself, but I inherited this car from my father, and cruise control was part of the package. He never knew cruise control was installed, but I discovered it by "reading the instructions", a rarity for all of us, it seems.

The Volvo's cruise control is one snazzy piece of engineering. In a freeway situation, you get the car wound up to a suitable speed and then press a small button in the end of the wiper control stick. From then on, the car maintains that speed within the width of the speedometer needle.

If you come to a hill, the cruise control depresses the accelerator pedal a bit more; if you're going down the hill it lets up on the accelerator, literally. The pedal goes up and down under your foot. This is quite disconcerting at first, like a ghost is driving the car. The control mechanism must be some kind of pneumatic feedback system to handle the accelerator with such delicacy.

The result of this is — given the right road conditions — the car will travel for hours at a time with its average speed equal to its top speed. It can knock over the kilometers at a furious rate. Common sense and a little high school physics suggests that the car is also at its most fuel-efficient, since it is moving at a constant speed. The only resistance to its forward motion is wind resistance and rolling resistance of the wheels. The weight of the car only comes into the equation on the hills, but downhills would tend to cancel uphills.

BACK IN THE OLD DAYS, YOU CLICKED ON SOMETHING, AND YOU GOT WHAT YOU

In my first experiment with cruise control, the Volvo made it all the way from Albuquerque New Mexico, to Flagstaff Arizona, about 680km, on one tank of petrol. Admittedly it was huffing and snorting and yelling "feed me!" as we rolled into Flagstaff, but during the journey it had made something like 36 MPG which is pretty good going for such a heavy car.

Adaptive systems

Now there is a new system: 'adaptive' cruise control. This includes a radar system that bounces signals off the car in front of you. It has two controls — one for the speed you'd like to go, and the other for the distance to maintain behind the car in front of you. If the car ahead pulls out and passes the car in front of it, your car accelerates and closes the gap to the next-car distance you've specified. If another car should pass you and jump in front, your car decelerates and widens the gap.

Accelerate — decelerate. Make all that iron speed up, then slow down. And that takes much more energy to maintain speed than the old speed-only system. American cops don't usually book you unless you're going at least fifteen percent over the limit, so I set my cruise control to ten percent over and let 'er rip. (We don't have speed cameras here, yet.)

It's true that most cars pass me, sometimes very much faster, but their average speed is often degraded by the need to sit at zero by the side of the road as the cop writes them a $200 speeding ticket. If there is a slower car ahead, it is a simple matter to ease out into the passing lane and gently cruise past them, all the time maintaining the set speed.

So adaptive cruise control — 'progress' — seems more to be a way to formalize the jumpy kind driving that drives other drivers nuts. Is this really an improvement in technology, or just a new way to complicate something that began life as elegantly simple?

Web TV

And since we are in a whinging mood, let's talk about the internet. Two or three years ago, stuff on the internet always seemed to work without complaint. You could click on a web page and it would soon be displayed on your screen for your perusal. Now every visit to a new site seems to be accompanied by a thought: What's going to go wrong this time?

This really came home to me after I did some major improvements to my modem installation (to be described in next month's Madhouse) and I decided to see if it improved the quality of television viewing on the internet. A couple of years back there were all kinds of TV signals to click on, programs from all over the world. But, because of lousy modem performance, I'd pretty well given the TV thing a miss.

Now the modem was going like a rocket, smooth as a baby's bottom, and I thought internet television would actually be watchable, instead of the series of jerks and stalls I'd put up with in the past. So within my bookmarks I clicked on Broadcast.Com, the previous source of many TV and radio sites. Now I only got Yahoo, which wanted to inspect my television requests before passing them along. There were also some nice new ads to watch. This, I believe, is known as a PORTAL, the coming thing to make the internet easier (?).

Speed Dome Cameras

NEW

These 1/3" Speed Dome CCD Cameras have built in Pan and Tilt motor drives. Panning angle is 355°, tilting angle is 80°, pan/tilt speed is 15° sec. Pan/Tilt is controlled by a remote controller, which even has a wireless remote control. Ideal for surveillance for retail stores, parking areas, foyers, etc, etc where a stationary camera will not see the whole area. Up to 4 cameras will operate from 1 controller unit. Available in both colour and black & white. Mini size - only 110(H) x 125(dia.)mm. Each camera is supplied with a 20 mtr. connecting cable using 6 pin mini din plugs. Extra cables and joining adaptors available. Controller required to operate.

Black & White

NEW

Includes Dome Camera, mounting hardware and 20 mtr cable (6 pin mini DIN plug to plug) and instructions. Note: You need a controller Cat. QC-3200 to operate.

Cat. QC-3210 **$549**

Colour

NEW

Colour version of B & W, as detailed above.

Cat. QC-3215 **$749**

Image Sensor QC-3210:	1/3" CCD B/W
Image Sensor QC-3215:	1/3" CCD Colour
Pixels:	512 x 582
Resolution QC-3210:	380 TV lines
Resolution QC-3215:	330 TV lines
Min Illumin. QC-3210:	0.1Lux
Min Illumin. QC-3215:	2.0 Lux
Microphone:	Electret
Lens:	3.6mm
Synchronization:	External
S/N Ratio:	48dB
Camera Power Input:	From Controller
Panning Angle:	355°
Pan/Tilt Speed:	15°/Sec
Tilting Angle:	80°
Size:	110H x 125 Dia

Controller to Suit Speed Domes

NEW

To operate a speed dome, you require this controller. It will accept up to 4 speed dome cameras and has an output for video out, audio out and monitor out. Controls for each camera is up, down, left & right. Also includes an infra red wireless remote control. Supplied with 1.25A 12VDC switchmode mains power pack Cat. QC-3200

Only $249

Extension Leads for Speed Domes

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Cat. WQ-7274 **$39.95**

Adaptor to join cables - 6 pin mini DIN female/female.

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This wireless colour CCD Camera and Receiver is packed with features. These include: •Camera supplied with adjustable 1/3" 6mm lens •Camera will run either on 8 - AA batteries which fit in the camera housing, or the mains plug pack supplied. •Bracket supplied to mount camera, which can be fitted either on top or underneath camera. •Camera has built in microphone for one way sound •Range is up to 100m in clear position •Receiver has RCA audio / video outputs to monitor. Specs: •Pixels: 512 x 582 •Resolution: 330 TV lines, •Min Illumination: 1 Lux •S/N Ratio: More than 45dB •Built in Mic: Electric condenser •Video/Audio Input: 1V p-p •Len: C/CS mount

Cat. QC-3440 **$699**

PROTECT YOUR HOME OR OFFICE

See Cat. page 115 for full details.

6500 8 Sector Budget System

Was $299

Includes:

- •1 x 8 sector Jaytech keypad alarm
- •2 x Micron pulse count PIRs
- •1 x Mains power supply
- •1 x 1.3Ah backup battery
- •2 x Reed / magnet switches
- •1 x Siren horn
- •60 Metres of 4 core alarm cable
- •2 x Stickers

Cat. LA-5444

SAVE $50

BIRTHDAY BARGAIN $249

6500 8 Sector Comprehensive System

Includes:

- •1 x 8 sector Jaytech keypad alarm
- •3 x Micron pulse count PIRs
- •1 x Mains power supply
- •1 x 1.3Ah backup battery
- •1 x Strobe warning light
- •1 x Siren cover
- •3 x Reed / magnet switches
- •1 x Siren horn •1 x Internal siren
- •100 Metres of 6 core alarm cable
- •2 x Alarm stickers Cat. LA-5446

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BIRTHDAY BARGAIN $339

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COLOUR

This colour video processor allows simultaneous display of up to 4 colour CCD camera inputs in split screen mode or sequential observation. A built in real time clock provides the time & date of recording and recorded video can be replayed via the video input. Includes mains power pack. Cat. QC-3364

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SAVE $100

Time Lapse Video Recorder

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Ideal for surveillance recording. See Cat. page 131 for full details. Cat. QV-3050

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10" B&W Security Monitor

See Cat. page 130 for details. Cat. QM-3402

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BIRTHDAY BARGAIN $169.50

6" 2 Channel B&W Security Switching Monitor

See Cat. page 130 for details.
Cat. QM-3400

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SAVE $20 ON OUR BATTERY CHARGER

12 & 240V Intelligent Fast Charger Discharger Deep Conditioner for Nicads & NI-MH Batteries - AAA, AA, C, D, 9V

See Cat. page 147 for details.
Cat. MB-3508

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550W 12VDC to 230VAC Inverter

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See Cat. P142. Cat. MI-5040

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NOW $249.50

THE $1 COIN B&W CCD CAMERA

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This micro-compact CCD Camera is the smallest we have seen. It measures only 25 x 25mm, the same diameter as a $1 coin. It features a low lux pinhole lens, audio and is supplied in a neat metal case, with mounting bracket and connecting lead. Specifications: •Image device; 1/3" CCD • Pixels; 500 x582 •Resolution; 420 lines •Sensitivity; 0.05 Lux, F20 •S/N ratio; >50dB •Power; 9 to 15VDC Reg •Current; 100mA Cat. QC-3473

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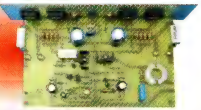
Jaycar ELECTRONICS Number 1 For Kits

100 WATT ULTRA LOW DISTORTION AMPLIFIER KIT

Refer SC March/May '00
Cat. KC-5288
$89.00
Heatsink not supplied.



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COMPACT FLUORO LAMP DRIVER KIT

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RUNNING LED DISPLAY

Exclusive to Jaycar.
Cat. KJ-8720
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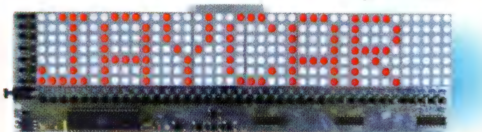

LED SANTA DISPLAY NEW

Ref: SC Nov 2000
Imagine Rudolph and Santa flying across your house this Christmas. Make it a reality using this fantastic display. Uses over 600 high brightness coloured LEDs to create a briliiant animation. Kit is supplied with PCB, all electronic components, LEDs, wire, plenty of solder and transformer. Only a little hardware, paint and paitience will be required. Cat. KC-5302 **$169**

GUITAR TRACK JAMMER KIT NEW

Ref: EA October 2000
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SWIMMING POOL ALARM NEW

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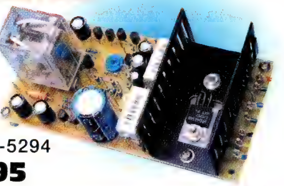

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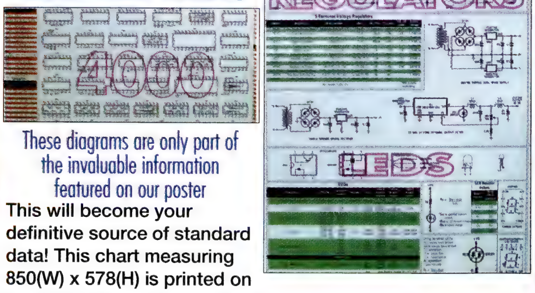

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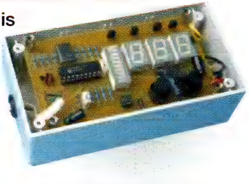

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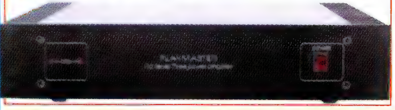

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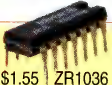

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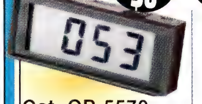

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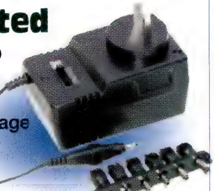

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BY STEWART FIST

The Congress petition

A NUMBER of citizens groups in the USA have recently joined forces to petition the US Supreme Court to safeguard public health and restore local control of siting of cellular towers. They've issued a couple of Writs of Centiorari — whatever they are.

The writs state that, since "Congress currently prohibits State and local governments from protecting the health of their citizens in regulating the placement of cellular phone towers by forbidding them to consider the health impact", then Congress is, in fact, forbidding them from making decisions in violation of the American Constitution.

They call on the Supreme Court to declare such provisions of the Telecommunications Act unconstitutional, because the rights of local control over public health are set forth in the Tenth Amendment of the US Constitution.

I happened to have a copy of the American Constitution (the American government gives copies away free), so here is what Amendment Number Ten says: "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."

You'd wonder why the American founding fathers bothered passing such an amendment, which in effect says that any powers not specifically given to the Federal Parliament in the Constitution belong to the State legislatures or the people.

Monty Python would characterise such statement as "The Bleedin' Obvious". But then again, laws are written for lawyers, and if deciphering the intricacies of such self-evident phrases keeps them busy, I guess we can be thankful that they are at least occupied for a time in a way that is relatively harmless.

When I read stories about citizens challenging the US Congress or the Australian government to make them take action or responsibility, one half of me wants to cheer, and the other half gets worried about the potential impact such actions can have on a wide range of services, including ham radio.

Council powers

Do we really want local councils making decisions of this kind? Do we want cellphone towers built on one side of the street, but prohibited on the other? Do we want amateur radio a legal form of recreation in Roseville, but not next door in Chatswood?

The writs claim that the ultimate effect of the regulatory power passing to local authorities will be "that local tower siting decisions will be made by local elected officials familiar with local conditions who will be sensitive to the placement of towers close to schools, playgrounds, recreation areas, nursing homes, hospitals, residential areas, and will exercise judgement based on these local conditions in light of current research into potential health effects of RF emissions."

I'm not so sure about that last statement, but conditions in the USA are different to those of Australia — their local councils are better and possibly less corruptible than ours, and their federal governments are worse.

However the half of me that cheers, says that strong public reaction is inevitable when industries like the mobile telephone carriers engage in outright deceptive practices, lie blatantly, manipulate the science, bribe politicians through massive ($US39 million) campaign contributions, and generally act with little regard to the rights and fears of the general community.

And there are also basic constitutional issues at stake. The old principle of "Your right to swing your arms, ends where my nose begins," applies equally to radio systems — even though the arms of a radio transmitter may be invisible. Your rights to transmit must only ever extend to the point where I am at risk of being harmed. Especially where my children are at risk.

Of course, the questions raised are: Who determines whether I and my children are at risk? Who collects, collates and weighs the evidence? How do they determine risks over the long-term — say 60 years? And, are a community's collective fears enough to warrant action?

If cellphones were an essential service along with wireline telephones, water, electricity and sewerage, we could be reasonably sure that the communal benefits would currently outweigh private fears and individual inconvenience. That's why those corporations charged with developing public infrastructure have always had special rights of access (called "eminent domain" in the USA) when it comes to putting in their pipes and lines, even across private land.

Essential cellphones?

However, try as I might, I can't accept that cellphones come into the same category. These devices have convenience and efficiency benefits in the community, but it really stretches credulity to categorise them as essential services. Despite this, the Australian government and governments around the world give cellphone companies these special siting powers.

Currently the determination of public risk lies mostly with the industry itself, or rather, with the radio industry through the IEEE and its associate organisations in other countries. In America, Europe and Australia the radio industry dominates the standards-setting processes because these supposed 'health standards' arose from electromagnetic-compatibility regulations to limit radio interference.

Radio emission standards are also part of the more general "radiation standards", so the radio engineers make their 'human-safety' determinations along with industry cohorts who are generally economic refugees from what remains of the nuclear power industry, and who promote nuclear medicine and the use of X-rays.

The nuclear power industry had both ionising and non-ionising (EMF) problems, and nuclear industry biologists generally believe that if the photon energy is not capable of chemical ionisation, then it is harmless. So radio signals, by definition, aren't capable of creating biological change — and no amount of biological research is going to convince them otherwise.

I can only assume that they don't read the literature, because, by definition, they must be blind. If radio photons can't initiate biological change, then it is logically follows that non-ionising 'visible' light also can't initiate biological change. Ipso facto; we are all blind, because without complex biological changes in the cells of the retina we can't see.

Most of the radio engineers who rise through the ranks and get on these committees also view the human body in terms of simple electronic circuits. They talk endlessly about wave-length resonant dimensions and thermal factors as if human cells and organs like the brain can be taken apart and reassembled with a soldering iron. Yet it is apparent that each cell is more complex than the latest Intel processor, and while it is only a fraction the size, it is possibly almost as electrically active and sensitive.

Biologically ignorant

I am constantly amazed at the sheer arrogance and ignorance of many people sitting on radio emission standards committees around the world. At least two thirds of them have never made any attempt to read any of the biological research literature, and most probably wouldn't understand a tenth of it if they did.

Yet they vote as a bloc against precautionary principles, and constantly claim that current levels are thousands of times lower than international safety standards — knowing full well that such standards have no foundation in fact.

Industries that employ such tactics to deflect criticism may win in the short term, but they always lose in the long. The problem is that, when they lose, they tend to bring related industries and services down with them. When dams burst, the flood produced is worse than if no dam had ever been built.

We saw this with breast implants, where Dow Corning spent so much time and money denying the obvious that no jury was ever going to believe a word they said — whatever the rights and wrongs of the matter.

The major long-term problem with cellphones is that the US industry has been so effective in lobbying Congress, and so generous in its funding of individual Representatives and Senators that they've managed to quash all research into cellphone health-effects now for a number of years.

According to Dr Louis Slesin, the editor of the journal Microwave News, there is no health research at all being conducted today in North America, even though evidence of long-term adverse effects has been growing steadily in Europe.

Congress actually terminated government funding for radio-health research, then conducted through the Environmental Protection Agency (EPA), back in 1996. They left it to the industry to do its own research through the Wireless Technology Research organisation that received $US27 million over six years from 1993.

The story of WTR's controlled-and-directed research funding fiasco is now well known, and its (ex-)director, Dr George Carlo, has joined the chorus condemning it as a sham. And the WTR efforts ended last year with the industry announcing that it would not be conducting any further research — and nor has Congress moved to force them.

This is election year, and political posturing and the party purse takes precedence over public health. So the US cellphone industry has given the FDA only a token $US1 million to do some trivial research over two years, while the two candidates and their parties scored about $US20 million each.

In such circumstances, it is difficult to argue with the petition's plea that "The Federal Government, [by] defaulting on its own obligation to protect public health, may not simultaneously prevent the States from taking action to do so."

"The power and responsibility to protect public health and safety cannot lapse," they say. "When the Federal Government fails to exercise it, the power necessarily reverts to the people or the States as part of their inviolable sovereignty."

I whole-heartedly agree, and I suspect there's a pretty good chance that this group will win. In fact, I think there's a pretty good chance that a well-funded action along the same lines would win in Australia, even without the backing of the Tenth Amendment to the Bill of Rights.

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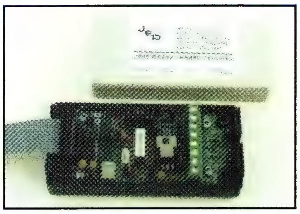
RS232 to RS485 Converter



The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.

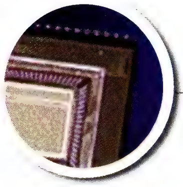
The J995X converter has an internal microprocessor to automatically connect the transmitter to line, so the user program need not use the RTS line for RS485 TX control.

Cost $176 plus $22 plug pack.

$330 PC-PROM Programmer
Also: Chiprase Eraser $258.50

This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.

JED Microprocessors Pty Ltd
www.jedmicro.com.au
173 Boronia Road, Boronia, 3155
Ph 03 9762 3588
Fax 03 9762 5499
(prices include gst & subject to change with exchange rate)



SILICON **VALLEY**

NEWS

IN BRIEF

Cisco buys PixStream
■ The latest acquisition by Cisco Systems is a US$369 million takeover of PixStream, a Waterloo, Ontario (Canada) company which makes hardware and software that allows cable, digital subscriber line (DSL) and wireless service providers to distribute and manage broadband video services like TV and pay-per-view programming.

Sales could grow into billions in the next five years."It's a small but rapidly growing market", said Ammar Hanafi, Cisco's VP of business development,

Atmel sues ST Micro
■ A new legal battle has erupted between semiconductor makers Atmel and ST Microelectronics. Atmel has filed a lawsuit accusing STM of violating seven of its IC patents.

The seven patents involved include some for a digital memory system and a method of fabricating an MOS memory array. Also included are patents involving an Atmel charge pump for providing programming voltage.

New wireless alliance
■ Ten leading high-tech companies including Intel, Dell, HP and Siemens have announced the formation of the Mobile Data Initiative Next Generation, aimed at developing standards to make it easier to get Web access from wireless devices.

Corning making DNA chips

■ **THE POTENTIAL OF** identifying new human genes and drugs to fight genetic diseases took a leap forward with the announcement by Corning that it is moving into the market of making microarrays. These are the 'DNA chips' that are used to analyze thousands of genes simultaneously.

Corning, a leader in the fibre-optic cable market, is deploying a new high-volume production technology that will speed current production of microarrays by at least 10-fold.

A Microarray is a glass slide, measuring about 75 x 25mm. Each slide can carry some 10,000 genes.

Market analysts forecast a huge demand for genetic information by biotechnology companies, government and academic laboratories. Sales of such data could swell from US$250 million to $1 billion in the next five years. Corning hopes to control as much as half of the microarray market, the current market leader in this sector being Affymetrix in Santa Clara.

Corning's production process is used to create optical fibre, ceramic honeycombs inside an automobile's catalytic converter, and a micro-printing method of applying decorative patterns to consumer cookware.

"We recognized that several of our core competencies — including advanced materials, surface technologies, and optics — could be brought together to develop a new solution for DNA microarray production", said Pierce Baker, Corning senior VP of life sciences.

Baker said Corning will be able to produce one microarray per minute, 10 to 20 times faster than manufacturing techniques in use today, and thousands of them instead of fewer than 500 on each production run.

Intel, IBM & HP fund new Linux lab

■ **A MAJOR NEW** high-tech alliance between computer makers and the Linux community has been announced. The new group will aim to unseat Sun Microsystems' Solaris operating system as the networking OS of choice in the Internet and enterprise computing markets.

The group is spearheaded by hardware vendors Intel, Hewlett-Packard, IBM, Silicon Graphics, Dell Computer and Japan's NEC. They are teaming up with the leading companies in the Linux community: Caldera Systems, Linuxcare, LynuxWorks, Red Hat, SuSE Linux, TurboLinux and VA Linux Systems.

The funding for the so-called 'Open Source Development Lab' will come mostly from the hardware companies. They have pledged millions of dollars and equipment to finance the centre.

Researchers will work on making improvements to the Linux kernel to increase its ability to manage large enterprise networks. To date, Linux has been employed mostly in small and medium-size companies. "Linux has to be industrial strength", said Will Swope, manager of Intel's software group.

Already, Linux is projected by research firm IDC to be the fastest-growing operating system for servers, based on new unit shipments. By 2004 it's expected to account for nearly half of new server installations.

The hardware companies are strongly motivated to make Linux succeed. Although they have to write off any chance of making money from the OS, they are currently facing an uphill battle in competing with Sun using their own proprietary Unix software systems. Others like Dell are using Linux to enter segments of the server market previously closed to them.

Pentium 4 breaks 2GHz barrier

■ **LESS THAN NINE** months after breaking the 1GHz microprocessor speed barrier, a journey that took the company 28 years to accomplish, Intel showed off its new Pentium 4 processor, with one version running at a stunning 2GHz and squeezing 42 million transistors onto the single chip — up from 28 million transistors on the Pentium III.

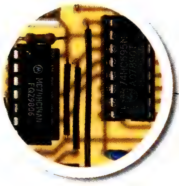
Intel demonstrated the new Pentium 4, along with faster Xeon server processors that will run at 1GHz (up from 933MHz), at its annual developers conference in San Jose.

The company did not estimate a shipping date for the 2GHz Pentium 4, but analysts don't expect it will be before the middle of next year. In the meantime, Intel will ship the initial Pentium 4 this fall (October) running at 1.4GHz. The 2GHz version will be available when Intel starts producing the chip with new 0.13 micron processing technology, as opposed to the 0.18um geometries used for the initial Pentium 4.

The demonstration puts Intel firmly back in the processor performance leadership position, which it has had to share with arch rival Advanced Micro Devices for much of the past year when AMD actually held a slight edge over Intel.

AMD, however, continues to win the battle for high-performance chips in the marketplace. Its fastest Athlon processor currently runs 1.1GHz. But that chip is already shipping in high volume while Intel's 1.13GHz Pentium III is not expected to be available in high volume for another couple of months.

The Pentium 4 features new 'NetBurst' technology that divides computing tasks into smaller sets of instructions, allowing the computer to complete the total number of instruction in a shorter time. Also, the chip's system bus will operate at 400 megahertz, allowing data transfer at speeds of 3.2GB/s. **ea**



Optical Tranceivers from Dallas

DALLAS SEMICONDUCTOR have released the DS1846 NV Tri-Potentiometer, Memory and MicroMonitor, a highly integrated chip that enhances laser control and design flexibility in optical transceiver modules. The DS1846 combines three linear taper potentiometers with nonvolatile memory and a CPU supervisor in reduced TSSOP packaging.

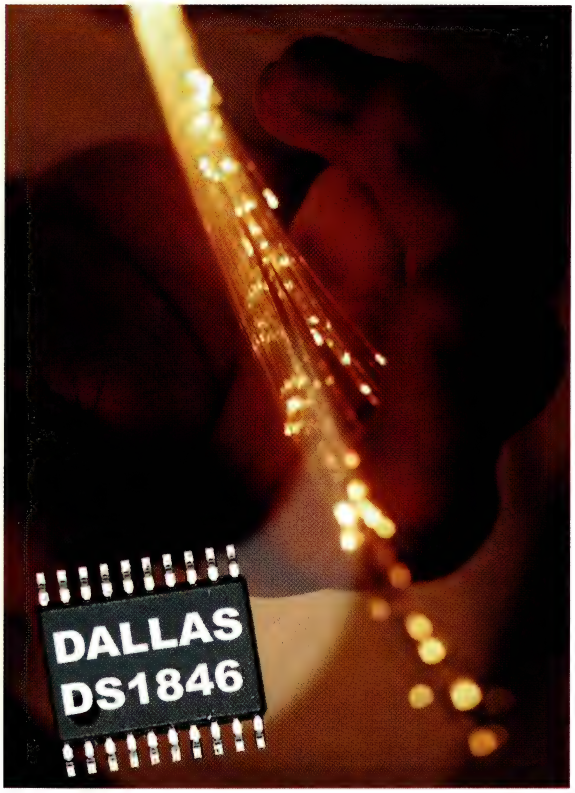
Digital potentiometers are used to automatically and precisely control bias currents to laser diodes in optical transceiver modules. Two potentiometers are required to control laser intensity; the third potentiometer can either provide additional trimming to one of the other potentiometers or control a separate system parameter.

Nonvolatile memory is required to configure and store application-specific calibration data and to control wiper settings for each potentiometer. The DS1846 also provides nonvolatile storage for user-specific data.

Optical transceivers are typically located in the electrical backplane of routers or networking hubs or on a server's motherboard. The DS1846's on-chip micromonitor tracks parameters critical to processor function. When a sense input detects an out-of-tolerance voltage level, the micromonitor initiates and holds a system reset until safe operating conditions return. The monitor is programmable for various voltage levels and includes a manual reset.

The DS1846 is designed as a control device for optical transceivers in gigabit Ethernet, fiber channel and SONET applications. However, it can also reduce parts count and cost in any application that requires a combination of memory, system supervision, and multi-parameter control.

The DS1846 communicates via a standard 2-wire interface and operates from 3V or 5V power supplies. It functions throughout the industrial temperature range (-40°C to +85°C). **ea**



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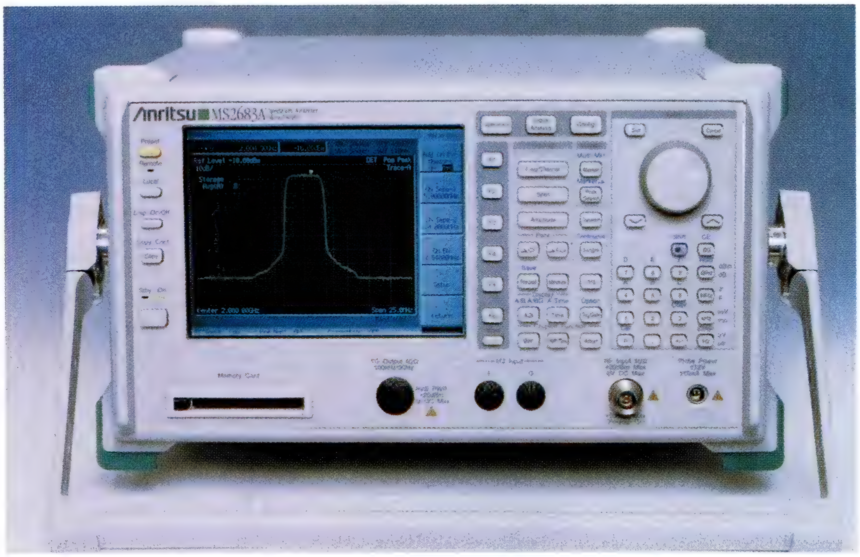
New spectrum analyser for 3G



THE NEW Anritsu MS2683A spectrum analyser has been designed to provide the optimum performance required for the evaluation of third-generation digital mobile radio systems utilising W-CDMA as well as emerging systems such as Bluetooth and Hypedan2.

The MS2683A covers the frequency range from 9kHz to 7.8MHz and is ideally suited to the development and manufacture of mobile terminals and for their parts including amplifiers, mixers, VCOs, etc, as well as in the installation of base stations.

The measurement functions of the Anritsu MS2683A include:

- frequency counter
- adjacent channel power measurement
- occupied frequency bandwidth
- average power measurement
- channel power measurement
- time domain template pass/fail evaluation
- frequency domain mask pass/fail evaluation

The MS2683A is characterised by a very wide dynamic range of 156dB typically, an excellent resolution bandwidth of 300Hz — 20MHz and a high sweeping speed of 20 times per second.

For adjacent channel power measurements in the case of W-CDMA signals, -68dB at 5MHz and -75dB at 10MHz is achieved. An optional precision reference oscillator is available with exceedingly low drift (+/-5 x 10^{-10}/day).

■ *For further information, please contact Anritsu Ltd, P.O. Box 817, Mt. Waverley, Vic 3149, or call 1800 689 685.*

Rugged hub

INTERLINKBT has announced the Ethernet Repeater — an eight-port, 10BaseT Ethernet hub designed for industrial applications. The rugged construction of the new hub withstands harsh environments, enabling Ethernet to be implemented in locations where it was previously impossible. The Ethernet Repeater manages communication and delivers regulated power for field devices with the features and performance of traditional hubs used in the office environment.

Measuring just 160 x 120 x 80mm, the Ethernet Repeater fits easily into small spaces. The compact, cost-effective hub reduces total automation cost, compared with point-to-point control using bulky expensive hardware and inflexible wiring methods.

The Ethernet Repeater monitors and indicates hub traffic continuously, keeping operators constantly aware of traffic status. Two integral power connectors enable users to connect redundant power supplies for additional production security.

The hub's durable aluminum housing, rated NEMA 6 and IP67, withstands harsh environments and eliminates the need for additional enclosures. Integral nickel-plated brass connectors, 8-pin eurofast for field devices and two minifast for power connection, provide plug-and-play convenience enabling users to create and reconfigure systems quickly for changing production requirements.

■ *For further information, contact Micromax on 1300 262626.*

Multi point servo

THIS NEW servopneumatic linear motion system from Tol-O-Matic offers precise multiple-point positioning, and is the first servopneumatic linear motion system to provide accurate and repeatable positioning at multiple programmed points-regardless of stroke length.

By combining a pneumatic mechanical system with an electric control system, the new PrecisionAire system can stop precisely at programmed points to +/-0.254 mm (0.010"), in stroke lengths up to 18 feet. Capable of speeds up to 100 inches-per-second, its accuracy and repeatability are unaffected by changes in load, line contamination, minor pressure changes, stroke length, or vertical/horizontal orientation. Designed to provide electronic position and velocity control with the power of air, the PrecisionAire system represents an inexpensive alternative to complex electric positioning systems.

Earlier servopneumatic systems used proportional pneumatic valves-controlling the velocity and positioning by changing the airflow rate to the cylinder. Because air is compressible and difficult to control, systems using proportional valves offer limited accuracy, +/- 0.1% of total stroke, and stroke lengths of less than six feet. PrecisionAire uses a Rheonetic magnetic particle brake for precise position control. The new system controls current to the brake, rather than airflow to the cylinder, for accuracy and repeatability unachievable with air control alone.

■ *For further information, contact Micromax on 1300 262626.*

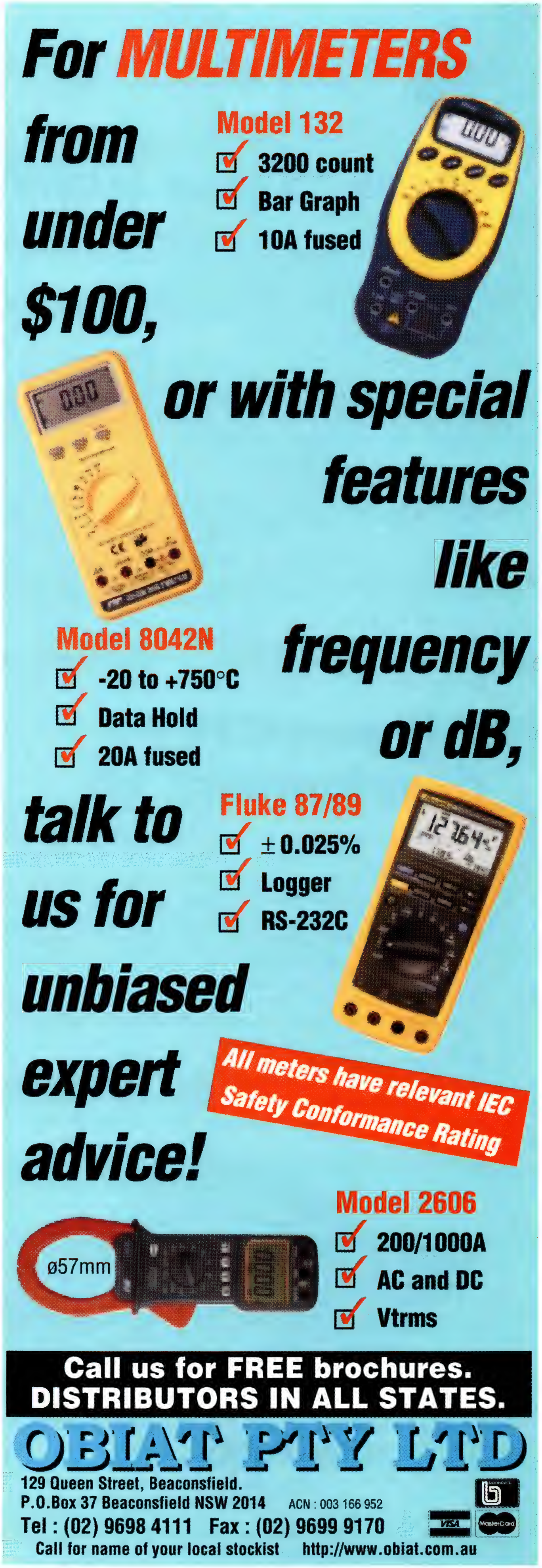
● ●

Phase control thyristors

THESE Westcode large area, phase control thyristors are suited to a large range of industrial applications. The devices have RMS forward current ratings from 3930 to 8170 amps with a heatsink temperature of 25°C.

Their junction temperature range is -40°C to +115°C. The devices are fast switching, having a standard maximum slew rate of 200V/us, and a repeatable di/dt of 150 amps/us. Slew rates up to 500V/usec are available. The repeatable reverse voltage range is from 5.3kV (for the lowest current rating) to 1.2kV for the highest current rating.

■ *For further information, contact Westek Industrial Products on (03) 9369 8802, or via their website at* ***www.westek.com.au.***



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Speak to your scope!

TEKTRONIX have announced an innovative software package that provides design engineers and technicians with a voice-controlled, multi-lingual user interface for its TDS oscilloscopes.

With the advent of VocalLink software, Tektronix delivers simplified operation of the oscilloscope to aid users dealing with complex probing situations.

Its introduction supports the company's commitment to deliver products that enhance the operational simplicity of the oscilloscope family, emphasized with the TDS7000 Series, the world's most advanced, most powerful Digital Phosphor Oscilloscope, announced last June.

Higher performance demands of today's electronic products, such as a next generation server or an Internet backbone component like a high speed router, have created densely packaged integrated circuits with extremely fine pitch leads. Probing these minute pins on a compact board requires precise placement and often the use of both hands, making it physically challenging to maintain probe contact while operating the oscilloscope. A simple distraction such as adjusting settings or looking away from the device to check an on-screen reading may mean the difference between success and failure.

VocalLink software allows users to maintain their focus on making solid, reliable connections to their device-under-test to ensure accurate, repeatable measurements.

Compatible with Tektronix' TDS3000, TDS500, TDS600, TDS700, and TDS7000 Series oscilloscopes, VocalLink software is available in two versions: Basic and Pro. Both offer a comprehensive command set, audio feedback, speaker independent capability and multiple languages. VocalLink Basic software offers more than 50 simple voice commands, while VocalLink Pro software delivers more than 60 simple voice commands and includes a macro capability.

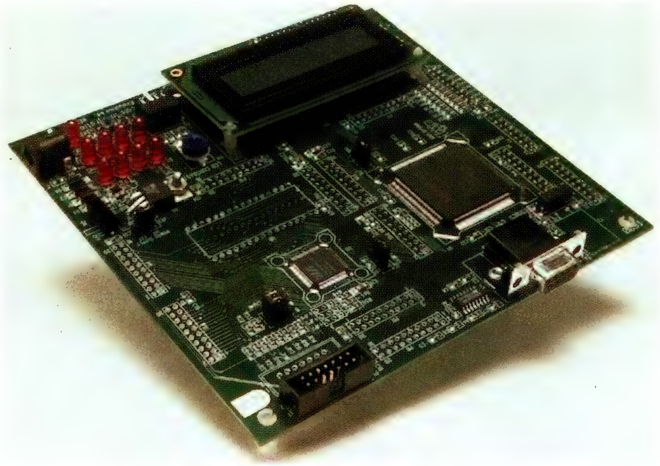
■ *For more information, contact Tektronix on 1800 023 342, or via their website at* ***www.tektronix.com.***

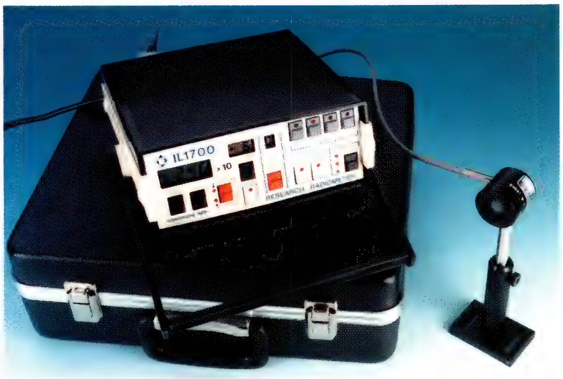
Infineon C167 development kit

WAFERSCALE Integration has introduced a development kit for the rapid prototyping of in-application programmable (IAP) embedded systems using any of Infineon's C166 family of microcontrollers. In-application programming is required in systems that need to remain functional while updating their own firmware — important in applications such as surveillance, data logging, automotive, and industrial control.

The DK4000-C167 Development Kit includes a fully populated C167 development board, Waferscale's FlashLINK JTAG programmer for 10 second in-system programming (ISP) of the PSD device, a serial UART cable for IAP, and a power supply. Also included is Waferscale's CD-ROM with the company's Windows-based PSDsoft Express EDA tool, an application to perform in-application programming from a PC, the DK4000-C 167 manual, application notes and reference designs.

■ *The kit is available for the low price of US$149, and may be purchased directly from Waferscale's site,* ***www.waferscale.com.***





New radiometer/ photometer

A VERSATILE radiometer/photometer system that includes an optical bench post, detectors, diffusers, and filters for quantifying a wide range of measurements in specific light units is available from International Light, Inc.

The IL1715 Research Radiometer/Photometer System includes the IL1700 instrument, an SED033 detector, Y photopic filter, F flat response filter, W diffuser, an optical bench post, and carrying case. Eliminating the separate instruments and detectors typically required for making both visible and radiometric measurements, this system provides direct readings in watts/cm^2, ft-candies, and lux.

Featuring automatic zeroing and automatic ranging during exposure integrations over an 8.5 decade range above nW/cm^2 and 5 milli-lux, the IL1715 Research Radiometer/Photometer System has a photometric dynamic range of 5 x 10^{-4} to 1 x 10^{+6} lux and a radiometric dynamic range of 1 x 10^{-9} to 2 x 10^{-1} W/cm^2

■ *The IL1715 Research Radiometer/Photometer System sells for US$2,867 complete, and literature is available upon request. For more information contact: International Light via their website at* ***www.intl-light.com.*** **ea**

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HISTORY & CROSSWORD

Published since 1922, **Electronics Australia** is one of the longest-running technical magazines in the world. Here are some interesting items from past issues:

50 YEARS AGO

Light Goes Faster: The generally accepted figure for the speed of light has been wrong by 11 miles a second, according to the British National Physical Laboratory.

The announcement said that the laboratory's experiments had confirmed the British figure of 186,282 miles a second obtained in 1947.

This figure would displace the previous figure of 186,271 miles a second which the American scientist Albert Abraham Michelson established.

Recent experiments in America and Sweden agreed with the new British figure to within one kilometre (five-eighths of a mile) a second.

Batteries drive Japan's jeep: The battery idea probably had a number of disadvantages which prevented it from making much headway against petrol driven cars. But in Japan, at least, it appears to be making a comeback in one of those fantastic ways, which are so crazy that only the Japanese, who doesn't know it can't be done, makes it work.

The cars are built by the Tokio Electric Automobile Company, according to reports, and will run 125 miles without a battery charge.

ELECTRONICS
Australia
HIFI NEWS
TV EDUCATION VIA SATELLITE
DATA SYSTEM FOR THE BLIND
UNIT PROTECTS HIFI SPEAKERS
DIGITAL ALARM CLOCK USES LSI
EASY TO BUILD RF Q-METER
SPECIAL CATALOG SUPPLEMENT

25 YEARS AGO

Australia's first general purpose mini: The first free-standing, commercially available general purpose minicomputer to be designed and manufactured in Australia has recently been announced by Computer Manufacturers (Australia) Pty Ltd of Sydney.

In hardware terms, the CM-202 is a general purpose 16-bit digital computer with memory expandable in 16k word increments to a maximum to 64k words. Standard processor features include double precision arithmetic, hardware multiply/divide, memory and DMA channel polarity, direct memory access channels, and a vectored priority interrupt system. The basic chassis contains the central processing unit (CPU) together with up to 32k words of memory, three integral peripheral controllers and three spare I/O slots.

Another video disc system ... this one from Hitachi: With one video disc system already on the market in Europe, and the two principal contenders in the video disc stakes, Philips/MCA and RCA, ready to do battle in the US, the Japanese company Hitachi has suddenly got into the act with a system of its own.

The new system, developed at Hitachi's Central Research Laboratory in Tokyo, uses an optical holographic approach and is said to provide 30 minutes of colour television from a 30cm disc. **ea**

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32														■

ACROSS

1 Device in common retail use. (3,4 7)

10 Ask questions. (7)

11 Finds precise position. (7)

12 Not function. (4)

13 Prefix with value of 102. (5)

14 Interferes with broadcast signal. (4)

17 Pointer of an indicating meter. (6)

18 Electro-optical shutter. (4,4)

19 Electronic character recognition. (1,1,1)

20 Releases grip. (8)

22 Moves across a surface. (6)

25 Check operational ability. (4)

26 Polymeric compound. (5)

27 Amplification. (4)

30 Irregular interstellar patches. (7)

31 Devices that extract data. (7)

32 Equipment that assists automotive tune-ups.(6,8)

DOWN

2 Gain for oneself. (7)

3 Holding device. (4)

4 Inventor of an IC engine. (6)

5 This allows multiple TV connections. (8)

6 Shape of a bridge. (4)

7 Inverter. (3,4)

8 The property of superconductivity. (14)

9 Physical concept with symbol L. (4-10)

15 A sump pump could have a ....switch. (5)

16 Succession of sounds. (5)

18 Former term (abbr) for hertz. (3)

19 Transient event. (8)

21 Little-used container in age of electronic banking. (4,3)

23 Colloquial term for accurate marksman. (7)

24 Phonetic word for a consonant. (6)

28 Project. (4)

29 Inventor of pre-electric safety lamp. (4)

OCTOBER SOLUTION

B	L	O	W	T	O	R	C	H	■	T	H	E	F	T
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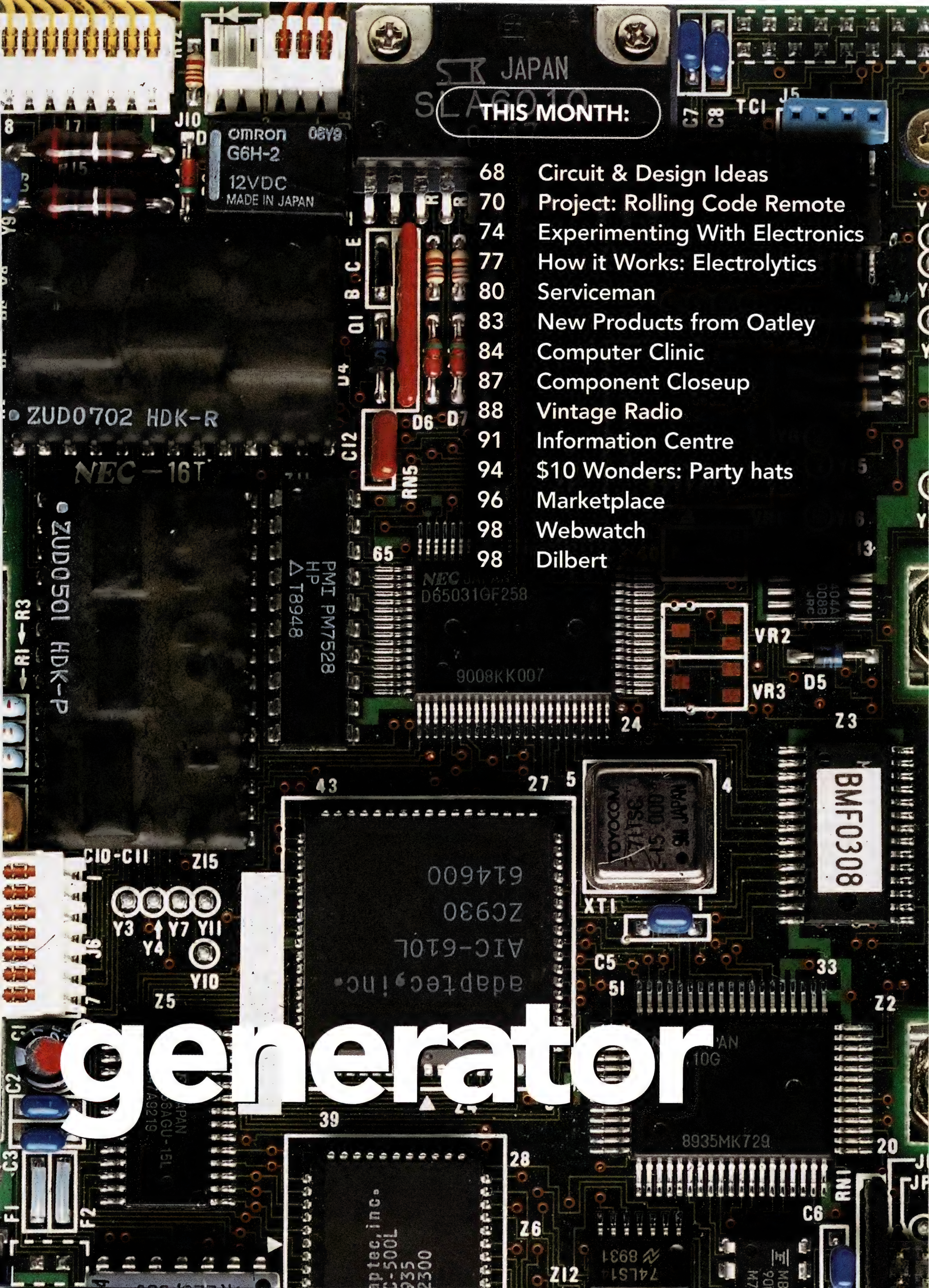

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77 How it Works: Electrolytics
80 Serviceman
83 New Products from Oatley
84 Computer Clinic
87 Component Closeup
88 Vintage Radio
91 Information Centre
94 $10 Wonders: Party hats
96 Marketplace
98 Webwatch
98 Dilbert

generator

Simple 240V light chaser switches at zero crossings

This design will control displays up to 3kW per 'phase' with virtually no RFI.

A simple unregulated power supply produces a nominal 12V DC, the positive rail of which is tied to mains active, thus the entire circuit is live. The triacs are turned on by drawing DC from their T1 terminals to their gates via the open collector drivers in the 2003 (a 7-way darlington driver).

To ensure that the gating current is applied (and hence removed) close to the zero crossing point, the clock is derived from the full mains voltage via the 220k resistor, this means that the BC557 will conduct soon after the neutral starts to go negative. The output cycling speed is set by the first 4017 decade counter (IC1), while the following 4017 (IC2) sequentially turns on the three driver/triac stages via pins 3, 2 and 4.

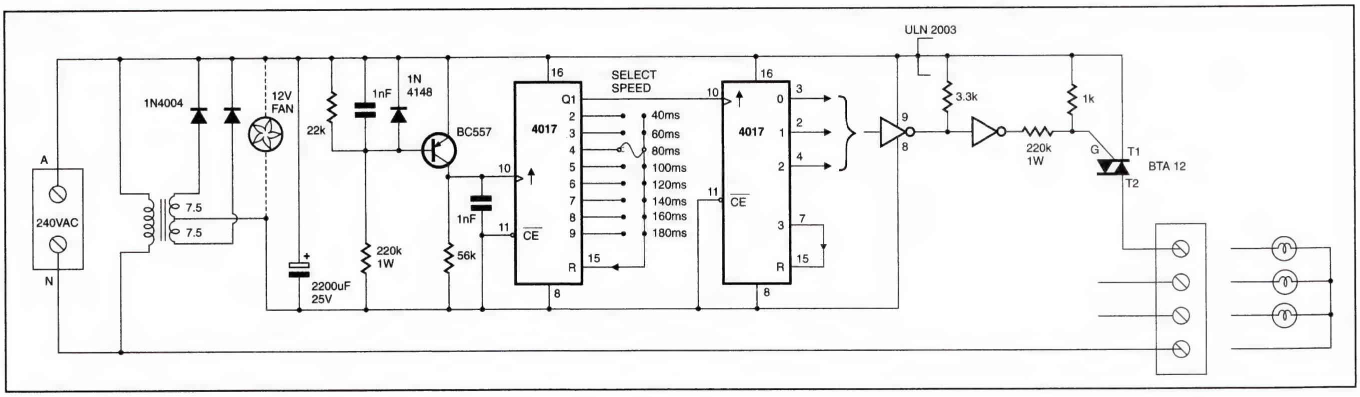
Heatsinking will be required for the triacs if switching a few amps per phase but not for Mickey Mouse applications like Christmas decorations.

When building this device, a defunct or unwanted computer power supply could provide some resources such as:

- ■ A rugged and well ventilated steel box.
- ■ An IEC mains input socket.
- ■ A power on-off switch.
- ■ A heatsink for the triacs.
- ■ A 12V cooling fan.
- ■ Various minor components.
- ■ The 120/240V slider switch could be used to select one of two speeds.

Graham Leadbeater
Ringwood, Vic

$30 voucher from
Jaycar
ELECTRONICS



ea Circuit and Design Ideas entry form

Use this form when sending in your Circuit and Design Idea (CDI) submissions and you'll stand the best chance of your entry being chosen, or better still, selected as our 'Idea of the month' prize winner!

Remember, this is also a forum for reader's design ideas, so the entry doesn't necessarily have to include a schematic diagram, or even be based on a circuit. So if you have an interesting electronics-related design or idea, send it in - you could have your contribution published, and profit from it too!

Send to: ***Circuit and Design Ideas Editor, Electronics Australia, PO Box 199, Alexandria NSW 1435;*** or Fax to: ***(02) 9353 0613***

Attached is my Circuit and Design Ideas submission.

Name . . . .
Address . . . . Postcode/ZIP . . . .
Country . . . . Phone . . . .
Email . . . .
CDI submission title . . . . Date of submission. . . . .

While we will certainly consider CDI entries that do not include this form, we strongly encourage readers to fill in the above information and send it along with their submission. It helps our filing system so we're less likely to loose your entry, and it makes sure that you include essential information such as your postal address - we can't send you a prize if we don't have that!

If you don't wish to cut up your magazine, make a photocopy of this page and fill that in, or just include the above details on a separate sheet of paper. Emailed CDI submissions should also include your details, preferably laid out as above.

CDI entries must be original, not previously published, and not concurrently submitted to other magazines. We consider all CDI entries, but cannot guarantee that yours will be selected for publication. ea

IDEAS

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

THIS MONTH'S WINNER!

$30 voucher from Jaycar ELECTRONICS

The 'Onslow' switch

One of my voluntary jobs in retirement is making devices to enable handicapped children to operate electrical toys.

One of these devices is the ONSLOW or THUMPIT switch. It was inspired by the slob character Onslow in the 'Keeping Up Appearances' television show. He, as fans will recall, always turned on the TV by giving it a good thump. Well, this switch operates on the same principle, and is a help for those unable to manipulate small controls. Others may find applications as well. There's nothing original in the circuit which is based on the Touch Switch project that appeared in May 1982 issue of EA.

Instead of the Veroboard touch plate used in that circuit, a thump sensitive switch was devised. This was built on the strip board with all the components mounted on top. The strip board sits vertically in a UB3 zippy box.

As shown here, a small spring is attached at one end to a circuit board pin so that it rests horizontally, and just clears the strip board. The free end is weighted by soldering on a couple of washers to give it some inertia, while the straight part of the spring lies between (but not touching) two more pins.

When the box is thumped the spring bounces up and down, and makes contact a few times. That's why the 7555 is in the circuit – it acts to debounce the switch action. The sensitivity of the switch can be adjusted by changing the washers, and a little experimentation will soon get it right.

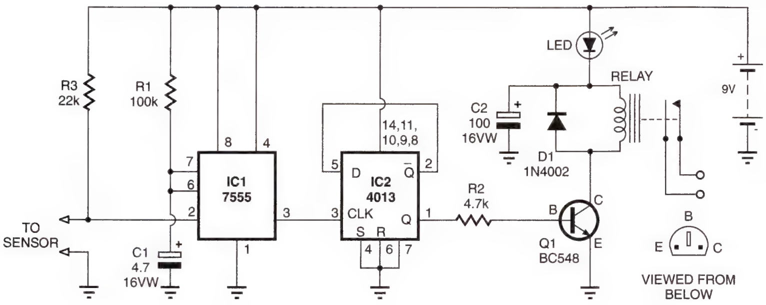
The original touch switch circuit is slightly amended as follows:

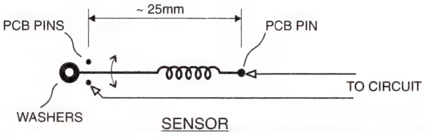
A LED is wired in series with the relay, to indicates when it's operating.

The relay is now a 6V 500 ohm reed relay (from Jaycar), and is suitable only for light loads – certainly not a mains power device. The box is fitted with stick-on rubber feet to recoil against to the thump it gets.

If this switch is to be transported by car it should be fitted with an on/off switch in the battery line. Otherwise vibrations will turn the relay on and off, and run the battery down.

A.J. Lowe
Bardon, QLD





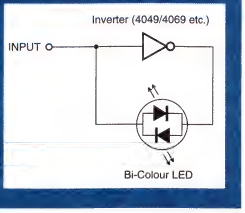
$30 voucher from Jaycar ELECTRONICS

World's simplest logic probe?

I found this simple logic probe extremely useful when I was programming the BASIC STAMP and other microcontrollers. It seems to perform almost all the tasks that a commercial probe can, apart from having hold and memory features.

The circuit is very simple, and relies on the fact that the input and output of the inverter are always opposite and thus this allows the LED's to light. This provides a green/red indication as to whether the input is high or low. An added advantage of using a dual colour LED is that when the line is pulsing both LED's will turn on and off in rapid procession, which gives the LED an orange colour.

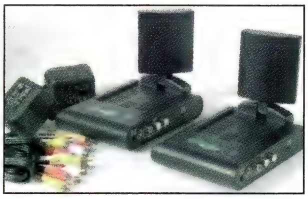
Tom Pike
Warrawee NSW



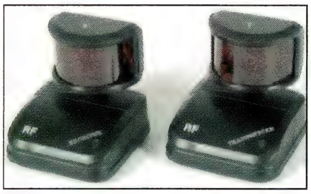
Win our 'IDEA OF THE MONTH' Prize!

Valued at around $300

Wireless Remote TV System



Here is a great way to share your TV and video signals all over the house. By combining these two excellent products, you can now watch your cable TV, video or DVDs in a different room, and still use the remote controls! You could even connect to a CCD camera to create a wireless surveillance system.



Jaycar ELECTRONICS

Cat. HB-6321 $26.95
Great for storing all your components.

This DMM also measures light & sound levels plus temperature and humidity.
Cat. QM-1580 $99.95

Top quality temperature controlled soldering station.
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Jaycar Electronics - Australia's favourite destination for the enthusiast and professional alike.

Call 1800 022 888 for our nearest store or visit our website at www.jaycar.com.au

BY ANDREW PALMER

Rolling-Code UHF
Remote Door Lock System

PARTS LIST

● resistors

R1	100 ohms 0.25W

● semiconductors

LED1	3mm high intensity red LED
D1	1N4004 or similar 1A diode

● miscellaneous

PC board,	64 x 37mm, code K157
RL1,2	12V DPDT relay, Anritsu SZ-2103
RL3	12V DPST relay, GS type ARW-SS-112D
RL5	12V/8A SPDT automotive relay

Rhino CLX UHF transceiver module; 2 x Rhino RCTX2 keyring transmitters; wiring kit.

NOTE: All of the above parts are available as a kit from Oatley Electronics, of PO Box 89, Oatley NSW 2223. The following prices apply at the time of writing.

Two Rhino RCTX2 transmitters & one CLX receiver	$99
Relay PCB and all other parts listed above	$22
Additional 12V/8A automotive relays, each	$3
Optional Zettler 250V/8A SPDT relays, each	$4
Additional Rhino RCTX2 transmitters, each	$30

Please add a further $7 per mail order to cover packing and postage within Australia.

Want to give your car the convenience and security of remote door locking and unlocking, but you've been put off by the cost of having such a system installed? Here's your answer: a low-cost kit which includes two high-performance code hopping UHF transmitters and a receiver module from respected Aussie brand Rhino, plus the relays you need to drive electric door locks, turn lamp status blinking and an ignition cutout. By providing the labour yourself, you can save a bundle...

MANY MODERN CARS are fitted with an electric door locking system, which can be operated remotely via small key-ring UHF transmitters. This kind of system is very convenient, and also very secure when the latest 'rolling code' or code-hopping technology is used. Because the transmitters and receiver never use the same ID/control code, it's virtually impossible for car thieves to use a scanner or 'code grabber' to snaffle the code and use it to open and steal your car.

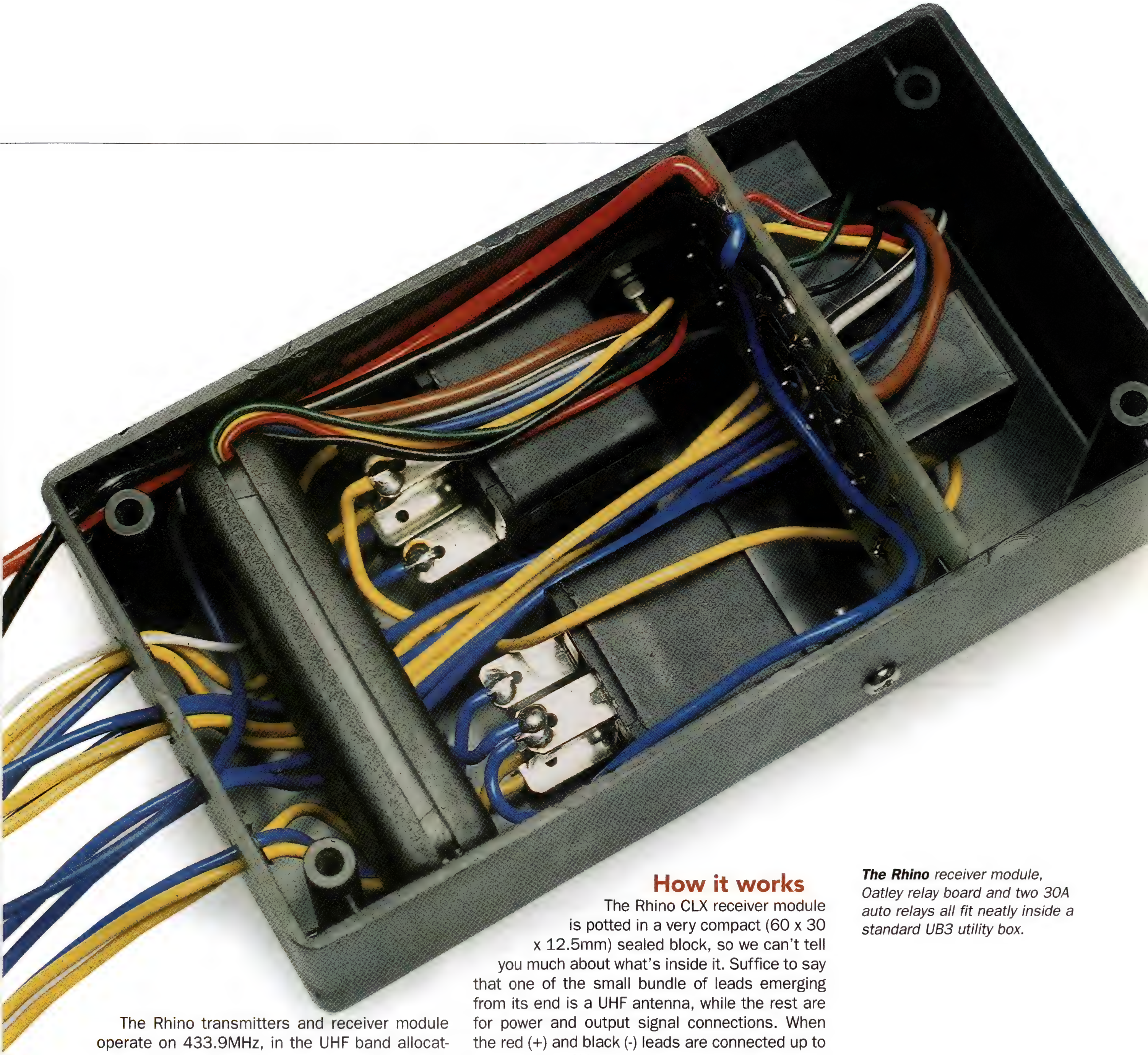
The same kind of system can be installed in virtually any existing car, of course, and Australian firm Rhino Electronic Security has established a very good reputation for the rolling-code remote control systems it designs and manufactures for this application. Like the firm's other security products they're reliable, well made and reasonably priced.

Unfortunately, though, labour contributes a major part of the total cost of getting one of these systems installed in your car. The job can take an auto electrician quite a few hours, and this all adds up to a fairly expensive exercise.

If you're reasonably experienced in electronics, though, here's an opportunity to save money: by providing this labour yourself. Happily this is now a lot easier, too, because local kit firm Oatley Electronics has done a deal whereby they're able to supply you with a DIY kit containing a couple of Rhino's RCTX2 rolling-code transmitters and a matching CLX receiver module, plus all the parts (including PC board) for a relay interface module which makes the job a lot neater and safer.

Purchased in this way the two Rhino transmitters and receiver module only cost you $99, while Oatley's matching relay module kit costs only $22 more. The relay module kit includes four relays: two for door locking and unlocking, one for blinking the car's turn indicator lights when the system is activated and de-activated, and a 30A automotive type for operating the ignition cutout function. It also includes a flashing 'armed' LED which can be mounted on the car dashboard, and a wiring kit.

So for only $121 (plus $7 for packing and postage within Australia), you can get all the parts for a car locking and unlocking remote control system. All you may need apart from this and the necessary labour are some door lock actuators — and these are readily available from firms like Rhino Security Systems (**www.rhinosecurity.com.au**).



***The Rhino** receiver module, Oatley relay board and two 30A auto relays all fit neatly inside a standard UB3 utility box.*

The Rhino transmitters and receiver module operate on 433.9MHz, in the UHF band allocated for LIPDs (low interference potential devices). As well as offering code-hopping technology for maximum security, they are completely wired and tested — and since they use quartz crystals and SAW filters, there's no adjustment or setting up. You couldn't get a much more user friendly or hassle free kit!

Incidentally the Oatley/Rhino kit can also drive a fifth and optional relay (a second 30A automotive type, available from Oatley Electronics for $3), which can be used for unlocking the car's boot. The RCTX2 remote control transmitters already have a second button which can be used for this very job.

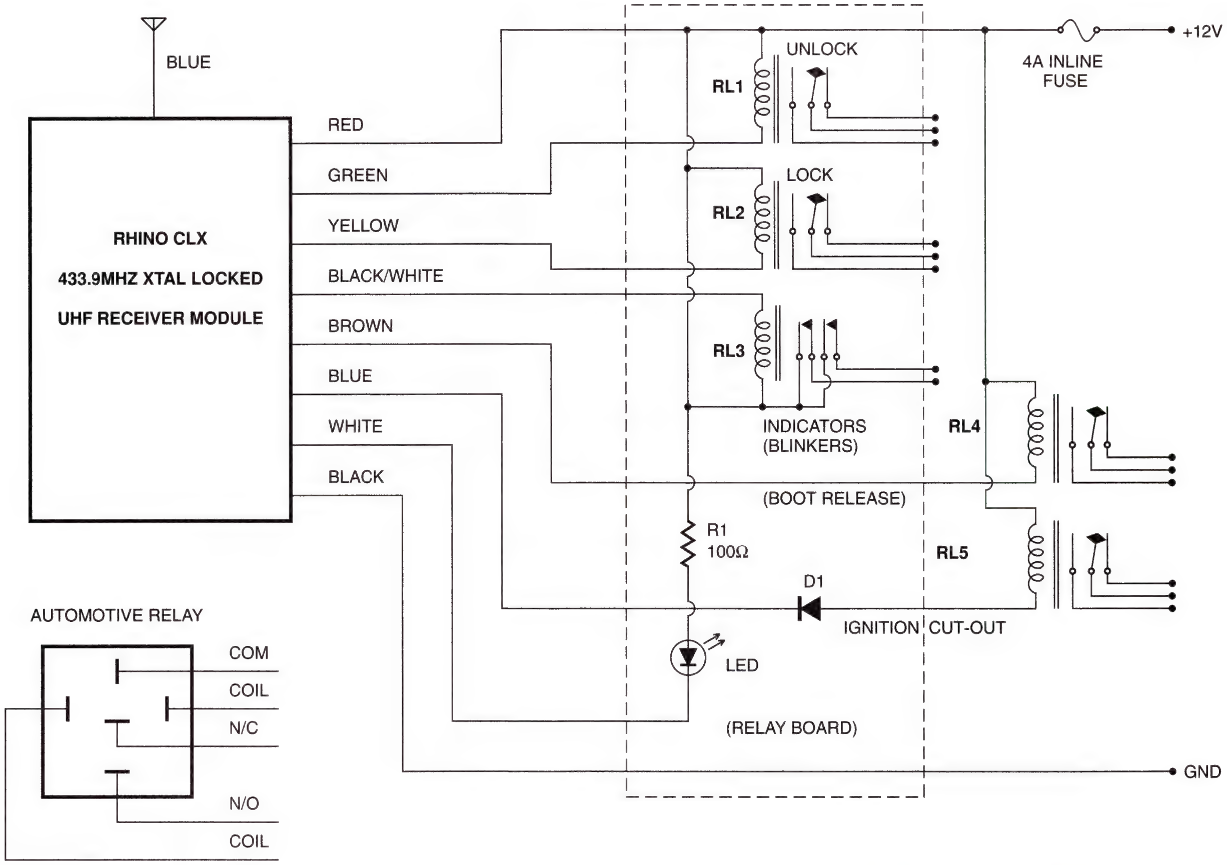
Another feature of the Rhino CLX receiver module is that it includes Rhino's Smart Code Learning technology, so that if you wish it can be 'taught' to respond to additional RCTX2 transmitters — great if more than two family drivers need access to your car. (Additional transmitters can be bought from Rhino or Oatley, providing you can show proof of purchasing a basic system.)

How it works

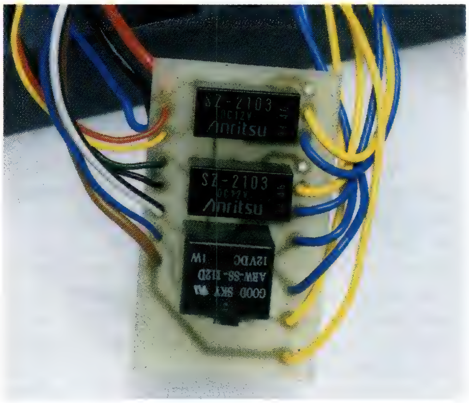
The Rhino CLX receiver module is potted in a very compact (60 x 30 x 12.5mm) sealed block, so we can't tell you much about what's inside it. Suffice to say that one of the small bundle of leads emerging from its end is a UHF antenna, while the rest are for power and output signal connections. When the red (+) and black (-) leads are connected up to your car's 12V supply lines, the other leads become activated in response to control codes from a matching RCTX2 transmitter.

All of the module's control outputs are normally high (i.e., floating), and are pulled low (i.e., to -12V or the car chassis) when they're activated. They can each sink up to 150mA, which allows easy driving of the various relays. Each relay coil is connected simply between +12V and the appropriate module output.

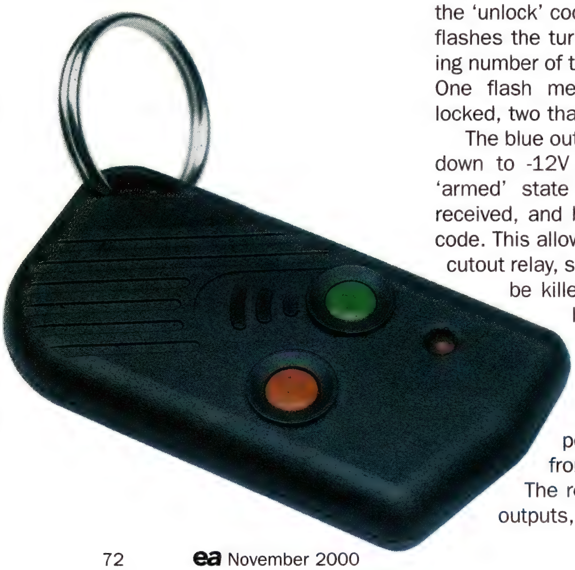
As you can see from the schematic, the module's green and yellow wires are those which control the door unlocking and locking relays respectively. They each pulse low for 0.5 seconds, in response to the appropriate codes from a transmitter. Here they're used to operate RL1 and RL2 on the Oatley relay board, and both relays are arranged to provide both normally open (N/O) and normally closed (N/C) contacts. This allows the system to be used to trigger either kind of central locking system — the type needing a 'negative pulse' trigger or alternatively the type needing a 'positive pulse' trigger.



***As you can see**, all the real work is done inside the Rhino CLX module – which combines a UHF superhet receiver with a digital rolling-code decoder.*



***Below:** The matching rolling-code keyring transmitter.*



The black/white striped output wire from the module is the one which controls the turn indicator light relay. Here as you can see it's used to drive RL3, a special type of relay (supplied) which is designed for this purpose. It has two separate contacts, so that the outputs can be connected to the 'right side' and 'left side' turn indicator lamps without bridging them and disturbing their normal function.

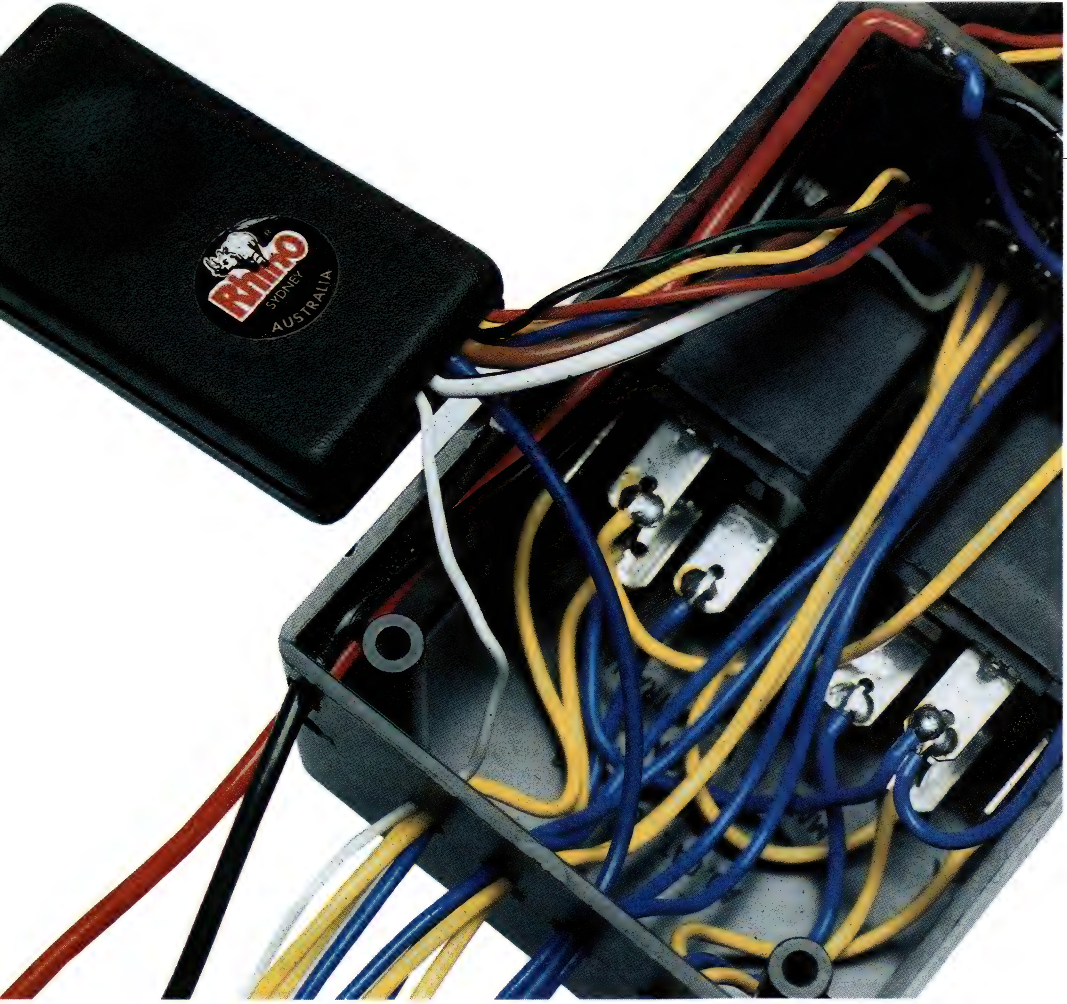
This output of the CLX module pulses low once when the 'lock' code is received, and twice when the 'unlock' code is received. So as a result, RL3 flashes the turn indicator lamps the corresponding number of times to indicate correct operation. One flash means that the doors have been locked, two that they've been unlocked.

The blue output wire from the module is pulled down to -12V whenever the module is in the 'armed' state — i.e., after a 'lock' code is received, and before arrival of the next 'unlock' code. This allows it to be used to drive an ignition cutout relay, so that the car's ignition system will be killed whenever the doors have been locked.

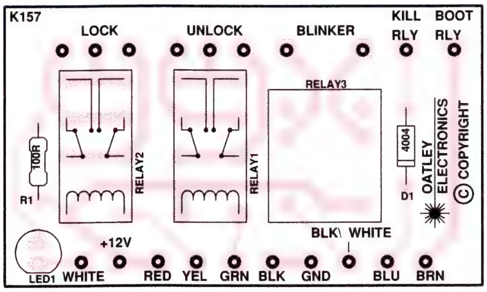
As you can see we achieve this by using the output to operate RL5, a 30A automotive relay. It's driven via D1, a 1N4001 power diode, to protect the module from back-EMF from the relay coil. The relay again has both N/O and N/C outputs, so you have plenty of flexibility in connecting it into your car's ignition circuit.

The white output wire from the CLX module is pulled down to -12V briefly once per second, whenever the module is in the 'armed' state. This allows it to be used to drive a blinking 'armed' warning LED, mounted on the car's dashboard if you wish. The LED is simply wired with its cathode connected to the wire from the module, and its anode taken to the +12V rail via a 100 ohm resistor (R1) to limit the LED current.

So far, we've described what's in the basic Oatley/Rhino kit, and what it can do. However as you can see from the schematic the brown wire from the CLX module can also be used to drive an optional second 30A auto relay (RL4), for activating a boot release motor.



Another view *inside the prototype box, showing the wiring to the auto relays. The wiring overlay for Oatley's relay board is shown below*



The brown wire is pulled low for 0.5 second when a 'boot release' code is received from a matching RCTX2 transmitter. (This code is only transmitted when you press the second button, coloured green.) Here the output drives RL4, if you add it, and this again gives you both N/O and N/C contacts to make it easy to control any type of boot release motor.

Note that the only relays mounted directly on the Oatley PC board are the smaller units — RL1, RL2 and RL3. The larger 30A auto relays are too big to mount on the board, but they have a mounting bracket so they're not difficult to mount nearby.

Putting it together

As you can see from the photo, it's quite easy to fit the CLX receiver module, the Oatley relay board and a pair of the 30A auto relays into a standard UB-3 size plastic utility box, measuring 130 x 68 x 43mm. This is only a suggestion, though. Oatley doesn't supply such a box in the kit, and only housed this prototype setup in one to show one practical approach that's neat and tidy.

The basic idea is that for safety and reliability you need to house these components in some sort of protective box, and they will fit comfortably in a UB-3 box or larger.

As mentioned earlier, only relays RL1-3 fit on the small interface module PC board, along with D1 and R1. The ignition cutout relay RL5 mounts nearby, as does the boot release relay RL4 if you need it.

The wiring of the PC board is very straightforward, as you can see from the overlay diagram. The relays will only fit on the board one way around, due to the spacing of their pins. The only real point to watch is that you fit D1 correctly, with its cathode band towards the bottom of the board.

Note that although the overlay diagram suggests that the 'armed' LED mounts directly on the board below R1, it actually mounts at a convenient place on the dashboard with a two-wire lead connecting it to the board.

That's about it. In the prototype shown, as you can see, all of the external leads to the modules were brought out at one end, near the CLX receiver module. However that's not essential; you could bring out the power leads, UHF antenna and armed LED leads at this end and all the other relay output leads at the other, if you prefer. It's really up to you, and what's most convenient.

The big job is going to be connecting it all up into you car's existing wiring, and perhaps fitting electric door locking mechanisms as well. Once this has been done carefully, all you'll need to do is fit a 4A inline fuse to connect the receiver and relays to the +12V, and it should all spring into life. There's no alignment, tuning or other setting up.

Over to you! ea

DARREN YATES

Transistors – 5:
Unusual circuits

This month, Darren Yates looks at some of the more unusual uses of transistors and some circuits to keep handy.

WE'VE SPENT the last couple of months looking at transistor amplifiers and while audio amplification was the first major use for early transistors, there's certainly a little more to these little fellas than meets the eye.

My father tells the story of how as a technician at Sydney's ABC Studios during the 1960s, very early transistors were flown in from the US to allow technicians to service equipment, however those transistors weren't as reliable as they are today.

Rather than throw them out, manufacturers would send letters telling those at the front-line of other uses for what seemed like 'dud' devices.

While you can easily argue there's little point in saving a 20-cent transistor today, there is much more to a transistor than a simple common-emitter amplifier.

ZENER TRANSISTOR

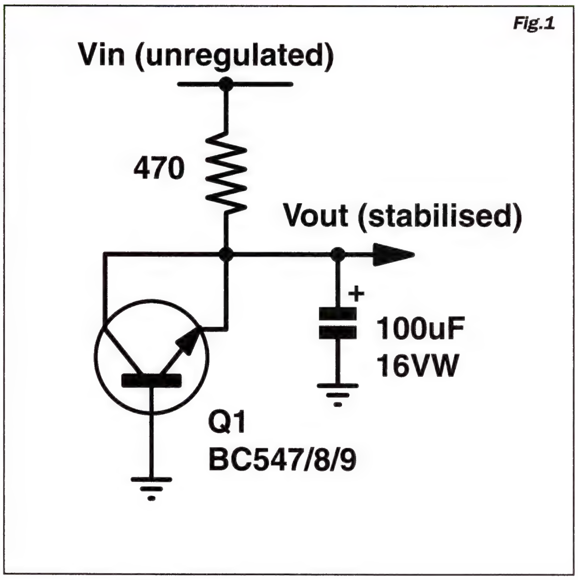


Fig.1

One of the added features discovered early on about transistors was that they actually make rather darn good Zener diodes.

Yep, that's right — Zener diodes.

If you look at the base-emitter junction of a transistor, you can see that the circuit symbol shows this junction as a diode, because that's exactly what it is.

Normally, the base is held 0.6V more positive than the emitter and the transistor conducts current from the collector to the emitter. (We're talking about conventional current here - yes, I'm sure there are plenty of engineers pulling what's left of their hair out but it's far easier to explain it this way.)

But what happens when you tie the emitter to the collector and then put your positive volts via a resistor on the emitter and ground the base as shown in Fig.1?

The base-emitter junction wired backwards like this has a breakdown voltage somewhere between 5 and 8V for most small-signal types such as BC547, 548 etc but it will vary from device to device.

In other words, it acts exactly like a Zener diode.

That variation means you'll have to build your circuit around it or try a few transistors until you find the right voltage but it's actually a better Zener diode than a conventional Zener diode.

Zener diodes are wired up so that the cathode is more positive than the anode. At some voltage point, the diode junction breaks down and allows current to flow however the voltage stays relatively fixed.

Increase the input voltage by 100 percent and the Zener-regulated voltage might change by 10 percent.

Using our transistor Zener, the regulation is significantly better.

Next time you're ferreting around for a Zener diode, you might find a transistor could do the job quite nicely.

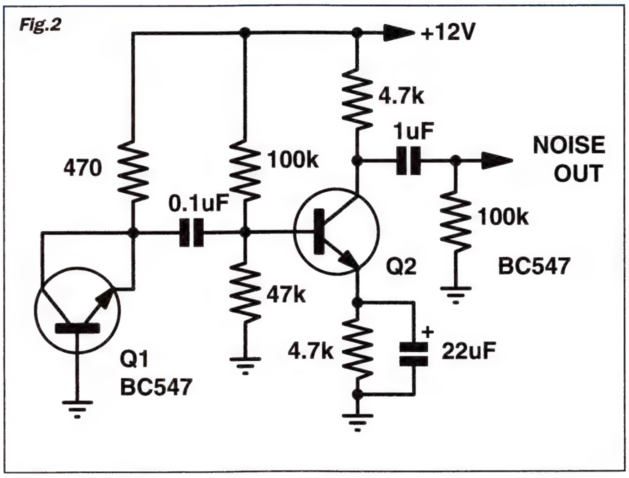
NOISE GENERATOR

That same junction is also an excellent source of 'white' noise. Different types of noise with varying frequency components are described by colours for example, white noise contains all frequencies at equal amplitude. Pink noise has a boosted lower range component.

Noise is often used to test amplifiers, mask digital audio compression artifacts and it also makes an excellent beginning to a steam train chuff simulator...

The circuit in Fig.2 shows how easy a noise generator is - a resistor, the transistor Zener and a capacitor. Feed the output to one of the preamps we looked at last month and you'll have more noise than you'll know what to do with.

Fig.2



Because of the Zener action, you'll need a supply voltage of at least 9VDC to get any sound out of it. 12VDC would be better.

You can make the emitter resistor as low as you like provided you don't exceed the power rating of the transistor but you shouldn't need any more than 5mA of current flow in any case — use that as your limit.

As with the pseudo Zener diode above, this circuit will work with any NPN or PNP transistor (remember to wire it the right way around) although the required supply voltage will vary depending on the transistor type. I've found that all of the common BC54X types produce copious amounts of white noise with a standard 12VDC supply.

GUITAR FUZZ AMP

Being a musician of sorts, I really enjoy being able to combine my hobbies.

We've already looked at one guitar fuzz circuit using an op-amp a few months ago but you can do the same thing just as effectively with a single transistor.

This circuit in Fig.3 allows you to create your amount of 'fuzz' — you'd call this a variable clipping amplifier.

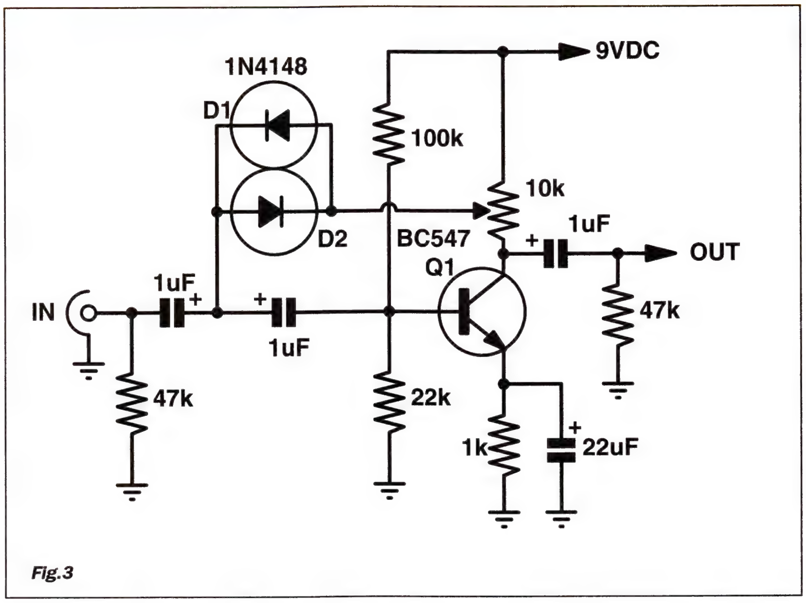


Fig.3

Looking at the circuit, Q1 forms a basic common-emitter amplifier with some additional feedback coming via two back-to-back diodes. These diodes provide clamping when the peak voltage rises beyond 0.6V. The amount of clipping is controlled by the 10k pot, which also doubles as the collector load for Q1.

You should find this circuit just as effective as the op-amp circuit we looked at previously.

Any small-signal NPN transistor will work in this circuit and if you're short on NPN transistors, you can even use a PNP provided you remember to turn the circuit 'upside down' and swap the polarity of the electrolytic capacitors.

The clamping action cuts off the tops of input signal, which has the effect of adding in extra harmonics into the waveform — it's this extra harmonic information that creates the distorted sound.

However, guitarists are notoriously fussy about their fuzz, and this is just one of at least a dozen circuits I know of to create this effect. If you don't like the sound of this one and you happen to be on the Internet, have a look and you'll find circuits for the others.

OCTAVER/FREQUENCY DOUBLER

This circuit in Fig.4 appeared in an old "ETI Circuits" book 20 years ago and is well worth giving a go if you want to create some really weird audio effects. It's basically a crude but effective audio frequency doubler.

The output is chock-full of distortion but again would be perfect for electric guitars producing harmonic effects. You could also use it as a fun chipmunk-voice toy for the kids.

Here's how it works:

Transistor Q1 forms a simple phase splitter i.e., the output signal at its collector and emitter are both equal in amplitude, but 180-degrees out of phase.

Transistors Q2 and Q3 form two emitter-follower amplifiers but with a common emitter resistor — it's similar in some ways to a differential pair. What happens is that Q2 and Q3 add the two out-of-phase signals together to produce a signal with half the amplitude but double the frequency.

Another thing you can do with this circuit is add in a simple mixer so that you can mix between the original signal and the new octaved signal. Because of the way it works, there is a fair amount of distortion in the output, making it suitable only for guitars and speech at best.

Give it a go and see how it works. For the price of three BC547/8/9 transistors, it's a good bit of fun.

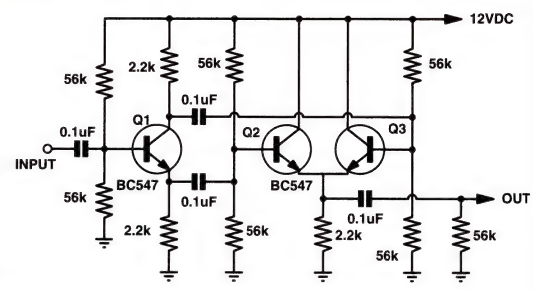


Fig.4

VOLTAGE DOUBLER

While we're in the mood of doubling things, here's a simple circuit in Fig.5 to turn 12VDC into 24VDC.

Transistors Q1 and Q2 form a simple astable multivibrator (squarewave oscillator) driving a complementary pair output stage.

The trick here is that the output from the joint emitters is used to double pump to series capacitors.

With no load, you'll get around 22VDC at the output, which drops down to around 20V with a 200mA load.

The circuit will double any input voltage from about 5V to 20VDC.

The output works like this — assume that the output of Q2 is low. This means transistor Q3 is off and Q4 is on. Capacitor C1 now charges up via the supply rail and diode D1 and the collector-emitter junction.

It also shorts capacitor C2 down to 0.7V via the same junction and diode D2.

Now when the oscillator flips and the output of Q2 goes high, Q4 turns off and Q3 turns on.

This charges up capacitor C2 from 0.7V to 10.8VDC — the reason it's 10.8V is because of the 0.6V drop across D2 and the 0.6V base-emitter drop across Q3.

But now that C2 has gone from 0.7V to 10.8V, capacitor C1 jumps from 10.8V to 21.6V.

The reason for this is that C2 can't get rid of its stored voltage instantly, and diode D1 makes sure that it doesn't just discharge back into the power supply.

The only thing to be careful of with this circuit is that the capacitors have a voltage rating of more than half the no-load output voltage.

For example, if you want to double a 20VDC input to a 40VDC output, make sure the capacitors are rated at least 25VDC working voltage. Because each capacitor only has the input supply rail across it at any one time, you don't need the capacitors to be rated at the output voltage.

While the circuit has no voltage regulation, it is inherently efficient even with no load - if the capacitors are fully charged to the limits of the circuit voltage available, then no current flows through them.

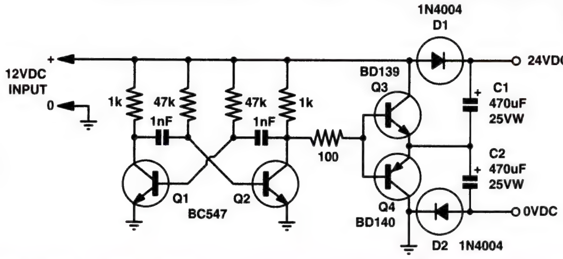


Fig.5

VOLTAGE STABILIZER

78XX and 79XX-series regulator ICs have become so common-place that you could be forgiven for forgetting how to come up with a regulated supply without one.

To be honest, I've actually turned right off these devices, despite their recent drop in price, mainly because of the large voltage differential required to ensure a regulated output.

For example, for a 7805 +5V regulator, you really need an input voltage of at least 7.5VDC to ensure it remains regulated, otherwise it drops its bundle bigtime and the ripple charges in.

A Zener diode, a transistor and a couple of capacitors might not give you the same regulation as a 78XX IC but a discrete circuit has some advantages.

Firstly, this circuit in Fig.6 is more flexible. 78XX chips only come in discrete voltage steps - to make them work at other voltages, you have to throw in a couple of extra resistors anyway.

Secondly, you don't need as large a voltage differential.

This circuit in Fig.6 will work with less than one-volt difference between input and output.

OK, that concludes our look at transistors. Next month, I'll be starting a new series on... well, you'll just have to wait and see. See you then. **ea**

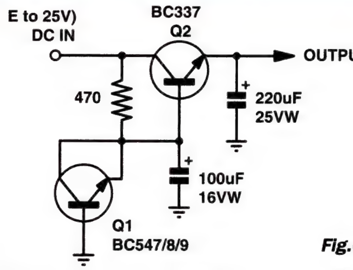


Fig.6

Electrolytic Capacitors

They're very common electronic components, used in just about every kind of circuit — and for decades they were cursed by service technicians, because of their poor reliability. But do *you* understand how they work, and why they *are* used? Surprisingly few people do... **By Jim Rowe**

THE BASIC PRINCIPLE of a capacitor is widely known, and fairly simple: if you have two conducting plates separated by an insulating layer, the coupling between them is purely via the electric field in the insulating material. The current flow through the capacitor is essentially only that involved in establishing this electric field and the corresponding charges on the two plates, and varying them in response to any changes in the applied DC or AC voltage.

As you probably recall, the capacitance value of such a capacitor is basically a measure of how much electrical charge is stored in it in response to the applied voltage. In fact the basic unit of capacitance, the *farad* (in honour of Michael Faraday) corresponds to a value where one coulomb of charge is stored in response to every applied volt. This is actually a pretty huge amount of capacitance, and that's why most practical capacitors have values down in the microfarad, nanofarad or even picofarad region.

What controls the *actual* value of any particular capacitor? Only a few factors, and they're fairly easy to understand. One is the surface area of the two plates: as you'd expect, the larger their areas, the higher the capacitance. Another factor is their spacing: the closer they are together (i.e., the smaller their spacing distance), the higher the capacitance.

Finally there's the *dielectric constant* of the insulating material between them — how readily it supports the creation and maintenance of an electric field, compared with nothing at all (i.e., a vacuum). Most insulating materials are *better* than a vacuum in this respect, although they vary quite widely with values of about 2.0 - 6.0 for paper and various plastics, 5.0 - 8.0 for glass, 5.5 - 8.5 for mica and from 12 up to many thousands for ceramics.

In fact there's a simple expression describing how these factors determine the capacitance:

$$\mathbf{C = e_0.K.(A/d)}$$

where **C** is the capacitance in farads, **A** is the surface area of the plates in square metres, **d** is the distance between them in metres, **K** is the dielectric constant of the insulating material (called the 'dielectric'), and e_0 is a constant known as the *permittivity of a vacuum*, describing the willingness of a vacuum to support an electric field. It has a value of 8.85×10^{-12}, with dimensions of farads/metre.

So knowing the surface area of the plates, their spacing and the dielectric constant of what's between them, you can work out the resulting capacitance.

Now ever since the early days of radio last century, there has been a need for capacitors of widely differing values — small values for tuning and coupling high frequencies, larger values for coupling and filtering lower frequencies, and even larger values again for smoothing DC supply lines and preventing unwanted AC coupling between the various stages of amplifiers, etc. So capacitor manufacturers have needed to make capacitors in a very wide range of values, from about 1pF right up to many thousands of microfarads. In recent years, even values up to one farad (1F) have been required.

Back in the early days of radio, though, the only dielectric materials available to make most capacitors were glass, mica and paper (often waxed or soaked in oil). These materials all have fairly modest values of K, and as a result it was actually quite difficult to make capacitors of high value without them becoming physically quite large. Even by using long strips of very thin metal foil for the plates and thin strips of waxed or oiled paper for the dielectric, and then rolling the lot up for compactness, it was difficult to produce a capacitor of more than about 2uF in a case volume of less than about $80cm^3$.

This was more or less the situation in the early 1930s, when the first mains-powered radios and amplifiers were being made. Yet the designers of this equipment soon found that they really needed capacitors of more than 2uF for smoothing the rectified AC in the power supplies.

Component designers therefore had to find a way of achieving more capacitance, without a dramatic increase in physical size. So because you 'canna

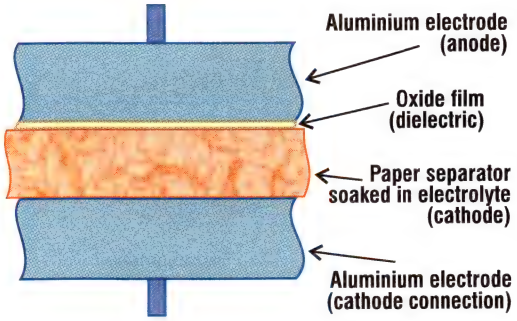

Aluminium electrode (anode)
Oxide film (dielectric)
Paper separator soaked in electrolyte (cathode)
Aluminium electrode (cathode connection)

***Fig.1:** A cross-section of a small section of electrolytic capacitor. Instead of being a separate layer of insulation, the dielectric is a very thin oxide layer formed on the anode metal.*

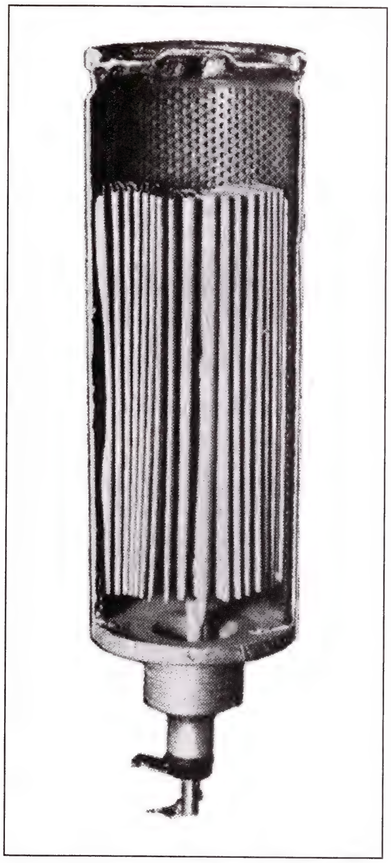


Fig.2: *Inside an early 'wet' electro. The pleated anode was immersed in a solution of boric acid and either sodium or ammonium borate, in water. This and the can formed the cathode.*

change the laws of physics', they had to find a way of somehow either achieving more surface area on the capacitor plates (i.e., increasing A), or reducing the spacing between them (reducing d), or using an insulator with a higher dielectric constant K — or preferably all three.

It was the electrolytic capacitor or 'electro' which provided the first practical solution. Even in its initial form it achieved a significant reduction in d, the dielectric thickness. That's because instead of using a separate layer of insulating material as the dielectric, the electro uses a film of oxide formed directly on the surface of one of the plates themselves, using an electrochemical process similar to anodising.

As you can see from the closeup in Fig.1, the plates of a typical electro are made from thin aluminium foil, and the oxide film is therefore aluminium oxide. By the way notice that the oxide is only formed on *one* of the two aluminium plates; the other plate is effectively just an electrical connection to the liquid or paste electrolyte which fills the rest of the space between the plates. It's really the electrolyte itself which forms the second 'plate' of the capacitor.

The thinnest practical layer of waxed- or oiled-paper dielectric that had been feasible at the time electros appeared was about 15um. It turned out to be fairly easy to form an aluminium oxide film much thinner than this, and if very pure aluminium were used the oxide was capable of withstanding hundreds of volts with a thickness of no more than 500nm — 30 times thinner than waxed paper.

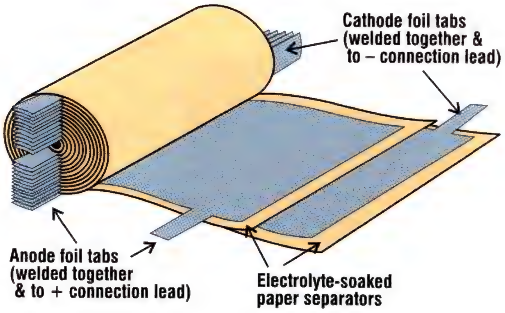

Cathode foil tabs (welded together & to – connection lead)
Anode foil tabs (welded together & to + connection lead)
Electrolyte-soaked paper separators

Fig.3: *A modern 'dry' electro is wound using very thin aluminium foils. Thin paper layers between the two foils support the electrolyte, which is glycol based.*

As the dielectric constant K of aluminium oxide is about 8.4, or roughly three times that of waxed paper, even the earliest electros therefore offered a capacitance density about 90 times that of waxed paper types, even for capacitors operating at hundreds of volts. For lower voltage types the improvement was even higher — over 300 times.

But was there any penalty involved in achieving this dramatic improvement in capacitance per unit volume? Well, yes. The main penalty is that the aluminium oxide film is *polarised* — it's only a good insulator for applied voltages of one polarity, where the aluminium plate it's formed on is **positive** with respect to the electrolyte. If the voltage is reversed, it conducts; and fairly heavily.

In fact the electrolyte-oxide-metal combination has many of the characteristics of a diode, and the rectifying properties of aluminium electrodes with oxide films were actually used in early 'electrolytic rectifiers'.

So unlike capacitors using paper, mica or more modern plastic dielectrics, electros are polarised; the filmed electrode must be kept positive (i.e., the anode) with respect to the electrolyte and other electrode (both of which form the cathode). The voltage between them can't be allowed to reverse, or the oxide film becomes more of a resistor than a dielectric. This is the main penalty we pay for their big improvement in capacitance density.

Another penalty is that even when connected to a DC polarising voltage in the 'correct' direction, the oxide dielectric of an electro is still nowhere near as good an insulator as materials like mica, glass or plastic film. A small 'leakage' current always tends to flow through it, especially when the applied voltage approaches the value of that used in the manufacturing process to 'form' the oxide film. As a result electros are not really suitable for applications where this leakage current upsets circuit operation.

Still, there are many applications where neither of these penalties is much of a problem, and that's why electros are still very widely used in many areas of electronics. Even though component and equipment sizes have shrunk dramatically since they were first developed, aluminium electros are still capable of providing more capacitance per unit volume than just about any other type of capacitor.

'Wet' & 'dry' types

In the first electros, the anode was a pleated rectangle of pure aluminium sheet with the oxide film formed on its surface, suspended in the centre of an aluminium cylinder filled with liquid electrolyte (Fig.2). The electrolyte was generally a solution of boric acid and either sodium or ammonium borate, in water.

As well as housing everything the outer aluminium cylinder also formed the connection for the cathode. Often a perforated celluloid sleeve was fitted inside the cylinder too, to prevent short circuits if the capacitor was subjected to physical shock. A rubber bung was used to seal the end of the cylinder, and act as a safety valve in the event that the electro became too hot and 'blew' due to excessive internal pressure buildup.

As soon as they became available, this type of 'wet' electro became virtually standard in the power supplies of most early radio and electronics equipment. However because this type of construction needed an anode plate of fairly thick aluminium (to be self-supporting), it didn't allow a particularly large plate area. So about 16uF was typically the largest capacitance achieved, in wet electros operating at up to 450V DC.

The next step forward came with the development of the 'dry' electro, patented by Alexander Georgiev in 1931 and available here commercially a couple of years later. This type of electro has a physical construction much more like that of conventional wound-foil paper or plastic capacitors, as you can see from Fig.3.

In the 'dry' electro both the filmed anode and the unfilmed cathode are now in the form of very thin aluminium foil, separated by layers of thin porous material (such as paper) soaked in the electrolyte — which is this case is generally boric acid and ammonium borate, dissolved in glycerin or ethylene glycol. This 'sandwich' is rolled up and housed in a small aluminium can (usually connected to the cathode foil and electrolyte), while the anode connection is brought out through a rubber sealing bung. Because there's very little if any water in the electrolyte, the dry electro is much more of a true sealed component than the wet type.

This 'dry' type of electro with its thin foil electrodes allowed a much greater anode area to be squeezed into a given can volume, and therefore allowed an even larger capacitance density to be achieved. This was especially true following the arrival of the next big development...

Anode etching

As mentioned earlier, the main improvement in capacitance density achieved with early electros came as a result of using a very thin film of aluminium oxide as the dielectric, instead of a separate layer of insulation. But at this stage there wasn't any real improvement in terms of effective plate area (A).

Before long, however, it was discovered that there *was* a way to increase the anode foil's effective surface area: by *etching* its surface before the oxide film was formed. The etching increased its effective surface area significantly — and with it, the capacitance.

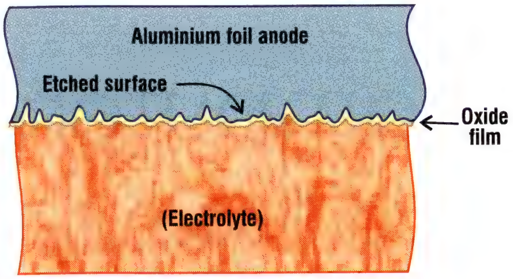


Fig.4: *By etching the anode foil before forming the oxide layer, its effective surface area is increased by up to 12 times – and the capacitance increased by the same factor.*

The etching is usually done either by immersing in hydrochloric acid, or in an electrochemical process where it is immersed in sodium chloride (salt) solution and a current passed between the foil and the solution. Either way, the etching forms millions of microscopic 'valleys' in the metal surface, increasing its total surface area by a factor of between 10 and 12 times. When the oxide film is formed on this textured surface, the capacitance is increased by roughly the same amount. (See Fig.4)

Needless to say electrolytic capacitor technology has been steadily improving ever since they were first developed. But the basic explanation of how modern electros can pack so much capacitance into such a small package is the combination of anode foil etching with the use of a very thin oxide film as the dielectric.

By the way they've also been improved dramatically in terms of reliability and reduced leakage current, too. This has mainly been achieved by the use of extremely pure aluminium for the anode foil.

Non-polarised electros

You've probably come across 'non polarised' electros, though. How are these different from the normal polarised type, so they can accept voltage of either polarity?

Basically in these electros, *both* aluminium foils are etched and have oxide films formed on their surface (Fig.5). So they act very much like two standard polarised electros in series back-to-back: whichever way voltage is applied to the capacitor, one of the two oxide layers is correctly polarised and provides the dielectric layer. The other one largely acts as an internal series resistor.

Non-polarised electros find use in various applications where they must carry AC without any DC to maintain correct polarising — such as phase-shifting capacitors in AC motors. However they tend to have a higher equivalent series resistance (ESR) than the normal polarised variety, and a lower ripple current rating. **ea**

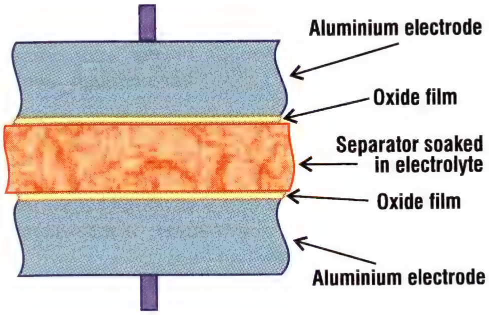


Fig.5: *In non-polarised electros an oxide film is formed on both foils, so either foil can become the anode depending on the polarity of the applied voltage.*

SERVICE**MAN**

Computers and **Clocks**

Modern electronics and old fashioned mechanics. This month's stories take us away from the usual TVs and videos.

IN RECENT YEARS I've had a number of submissions on the subject of computer problems and a good many of them concerned software confusions.

At first, I agonised over those stories of the software persuasion. I don't like to reject anything that is interesting and reasonably well written. But then this column is about servicing hardware, so I have reluctantly sent back a number of good software stories. Hopefully, they have turned up in the computer pages of this or other magazines.

The first contributor this month is a case in point.

Stephen Davis, of St Peters in South Australia, sent in two interesting items. The first was all about software incompatibilities and, while it was interesting to a computer buff, it would have been meaningless and totally confusing to a man with a soldering iron.

On the other hand, Stephen's second tale mentions software problems only in passing. His main trouble turned out to be technical and very much hardware related. Here's what he has to say...

Exceptional fault

Physical problems in a computer can cause bizarre problems. Four years ago, I bought a generic computer system (Pentium 133 with 32MB EDO RAM and running Windows 95 OSR2) and I was initially reasonably happy with the system.

I say reasonably, because every now and then, the system would crash with a 'fatal exception' fault. This occurrence was so random and intermittent that I could never see a reason for it, and those who know about these things assured me that this was to be expected occasionally with Windows.

However, my complacency eventually changed when, after right clicking a simple text file to see its properties, a ridiculous file size was displayed (in the order of hundreds of megabytes) and my computer crashed again.

The screen froze with an error message telling me that I would have to reinstall Windows and subsequent booting into safe mode led me to a message telling me that no safe mode drivers were present! And anyway, I was told I didn't have enough memory to load the registry!

Well, many hours of psychological pain followed, trying to fix things up. I finally decided to reformat my C: drive and reinstall Windows, in effect going back to 'New Computer Mode'. I had a slave hard drive in my system as a D: drive, and this had a fully bootable Windows 95 operating system on it.

Unfortunately, this was a version of Windows 95 that was earlier than the one I was trying to install (I had just swapped hard disks around when I had added a second hard disk). Disk Doctor didn't appear to like my D: drive very much and kept freezing or aborting the installation process, with a message that an earlier version of Windows was present and that the Upgrade version of the program was required.

(I had actually been sold a generic system that had the earlier version of Windows 95 installed on the hard drive, while the Windows CD that I had been given was the later OSR2 version.)

Ugly message

Amidst all this mayhem another error message reared its ugly head a number of times, both during the process of trying to fix the innumerable errors that were present on my disks and during the initial stages of the installation of Windows.

The error was reported thus: Expression:idx start<nmem Blocks "A logical assertion has failed. Source:line 264 of msprint f.c. Go to Microsoft product support". This was all gobbledygook to me so I turned off my machine and left it for a while, feeling somewhat disconcerted. When I turned the machine on again it appeared to be working perfectly, with no error messages, so I was able to start reinstalling Windows.

I overcame the 'Upgrade version of Windows required' message by renaming the file WIN.COM on my D: drive as WIN.OLD (a hint I picked up from the internet) because it is WIN.COM that tips off OSR2 that there is another version of Windows somewhere in the system.

I finally managed to reinstall Windows, and then went through the laborious process of reinstalling all my software. Unfortunately, crashes still occurred sporadically.

As the computer was still under warranty, I took it back to the supplier who assured me that there was nothing wrong with it. I must admit that this answer did not surprise me, because, as a electronic hobbyist, I am familiar with how deceptive and hard to track down these intermittent faults can be.

These crashes started occurring more frequently as time went on, so I knew I had to fix the fault myself if I was to have any peace of mind when using my computer.

First of all I combed the internet, and looked into newsgroups and Microsoft itself, hunting for tips as to what can cause these intermittent faults. I sifted through a lot of garbage and I carefully wrote down any solutions that would fit my circumstances. What began to stand out as a prime candidate for these sorts of errors was physical memory. This seemed to make sense, for if memory is faulty, wrong addresses may be utilized with subsequent errors. It could also result in fatal consequences if protected memory is addressed.

Anyway, I used Norton Diagnostics to thoroughly check physical memory after disabling L1 and L2 cache in the CMOS setup. This was probably not necessary as the program goes sequentially through memory, but the *memory checked out OK anyway.*

Now, if the errors were memory related, I still had to check out the cache memory. I disabled the L2 cache but the errors still occurred. I then disabled the L1 cache and found the errors disappeared. No matter what I did with the computer over the next few days, it did not miss a beat.

Now the L1 cache is inside the Pentium microprocessor chip, and knowing that this would not be an item the supplier would happily replace, I opened up the case to see if there was anything unusual in the vicinity of the microprocessor. (Warranty is usually voided when cases are opened up, but I believed myself to be justified as they had not been able to rectify a genuine fault. Anything I could do to lead them in the right direction was doing both of us a favour).

New Fan

Everything seemed OK, with nothing out of place and the fan operating normally above the microprocessor. I then took the computer back to the supplier's store, bringing them up to date with what I had done.

I returned to the store a couple of days later and was told the computer was fixed. When I asked what the problem had been, I was told that the microprocessor fan had needed replacing. Having seen the original fan working and puzzled as to why it needed replacing, I asked to speak to the senior technician. He admitted that although the fan had been working, it wasn't up to specifications for a Pentium, and that my problems had been due to an overheating microprocessor.

He had fitted a fan with higher specifications and he assured me that my computer was now fixed. He was right. The computer system was as stable as a rock. It has had heavy use (and is still functional) and there are no errors at all. The technician told me that in his experience, problems with 'cache on a stick' (the L2 cache) is a common cause of fatal exception errors. And cheap low spec microprocessor fans are another common cause of errors and crashes.

When the L1 cache within the microprocessor gets above a critical temperature, the information contained within gets scrambled. Hence the error messages. In retrospect, it does seem amusing that wasted time and hours of frustration can be caused by somebody saving a few dollars on under-performing microprocessor fans.

And, if what I read in the newsgroups is right, this is an extremely common occurrence. With inbuilt temperature monitoring of microprocessors now becoming common, hopefully this problem will disappear. Looking at the sequence of events described above, it can be seen that the various errors did seem to only be present when the microprocessor was warmed up, because whenever I turned off the computer and returned to it after a few hours, the errors were no longer present.

The errors became more frequent as time passed, because the cheap bearings in the fan were wearing and slowing the speed of the fan, causing faster heating up of the microprocessor. It all seems so easy and obvious in retrospect, especially as I did notice that the fan was getting noisier all the time. But I suppose at the time I did not realize how critical microprocessor temperature is. And, naturally, it's the cache memory inside the microprocessor that is the first to feel the heat.

So there you are. At first, Stephen's problem looked as though it was software related. Naturally, he didn't anticipate mechanical problems in a computer 'under warranty'.

But as time passed, it became more and more obvious that software was not the problem and that a mechanical or electronic fault was the more likely. Thanks for that story, Stephen. It makes a change from interminable TV/Video recorder stories. And I hope you can find a home for that other story.

Printer problems

Incidentally, I am having a similar experience with my 'other' computer - a PC running Windows. I was recently given a Pentium S100 motherboard, a significant improvement on the old 486DX66 that I've been using for some time. Unfortunately, although the upgraded computer is now much faster than it was, it has an annoying intermittent fault.

More often than not, the printer refuses to work and returns an error message saying that it's fitted with the wrong ink cartridge. It's not, of course, but the thing won't work while the driver software thinks it has the wrong ink present.

The trouble has to be an intermittent somewhere in the system. So far, I have checked out the various cables and have found no problems. The printer is OK on another computer, so it has to be an intermittent on

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the motherboard. Perhaps that's why it was given to me in the first place.

Nevertheless, if it's a physical problem, I should be able to find it eventually and it may make a worthwhile story for these pages. Keep watching. (Incidentally, in these days of on-line communications, I have far less need for a printer since most of my output is now e-mailed direct to the addresses .)

Oh! There's something I should mention in passing. We are all, as consumers, partly responsible for underrated fans and other cost saving measures. Stephen more or less admitted responsibility when he bought a 'generic' computer. Why not buy a good brand name machine? Why, cost of course!

A brand name manufacturer would not want the expense of repairs under warranty, nor would he want to risk the good name of his product. So, he uses only top grade parts and charges accordingly.

Personally, if I were looking for long and reliable service from an appliance, I'd hock my pension to buy the best brand name product available. Of course, I would have to go without a few lunches to pay for it, but at least I could expect long and reliable service from the product and the strong likelihood of spare parts being available if repairs are required in the future.

Next, we slide effortlessly from modern computers to old fashioned clocks.

Pendulum power

Have you noticed that modern clocks don't 'tick' any more? There used to be something reassuring about the steady tick-tock of the bedside clock in the dark hours before the dawn. But on to our story...

I was recently asked to solve a problem for an elderly customer of long standing. It appears that she had wanted a pendulum clock like one they'd had many, many years ago. Her dutiful son bought one at a large discount story and the old lady was delighted. Except that one day the pendulum stopped swinging, yet the clock continued to read the right time. Could I please restart the pendulum and explain what was going on?

When the clock was delivered to me, it was still showing the correct time. And when I set it up on the bench, the pendulum began wagging merrily, just as it was supposed to do. I couldn't tell the son what had happened on this occasion but I was able to explain that the pendulum was merely a showpiece and had nothing to do with time keeping.

In fact, the clock used a common quartz movement, driven by a single AA cell. Presumably there was some kind of kicker mechanism to keep the pendulum swinging but as I didn't open the case, I can't be certain.

I was reminded of this last night when my own 'Pendulum Clock' stopped. I had acquired the clock years ago in a box of 'junque' I had bought at auction for $1. The clock was unusual in that it had no provision for winding the mechanism, and although it was not branded 'Quartz Movement', it did have provision for a 1.5V D cell in the movement housing.

Later, when I had blown out the dust of ages and fitted a new D cell, the clock made a brief buzzing noise then sat there, doing nothing. Thinking that it might need a kick start, I moved the pendulum slightly and away it went, ticking away quite happily.

Seven minutes later, it made another buzzing noise, and so on every seven minutes.

Pressure of work prevented me from doing anything else with the clock for some months. It had proved to be intermittent to some degree, running well for a week or more then stopping every few minutes over several days. The only other problem was that it gained as much as ten minutes a day when it was running properly.

Then our kitchen clock started to play up. After I had repaired it, as described in these pages a year or so back, I thought I might check out the old pendulum clock. It might be useful as a backup if the kitchen clock ever failed completely.

No electronics

When I examined the works behind the dial, I found that there was no electronics at all. The mechanism was a perfectly ordinary mechanical escapement setup, just like a small version of an old mantel clock.

To make matters more confusing, there was no main spring, at least in the usual sense of the term. Instead, it had a thin, single turn coil spring inside a cam switch. As I watched, the spring slowly unwound as it drove the pendulum via a conventional escapement. At the same time the cam switch rotated to the point where it closed a circuit involving the D cell and a tiny 1.5V motor.

As soon as the switch closed, the motor began to rotate the cam switch in a direction opposite to its normal motion. This had the effect of winding up the little spring inside the cam. This was all the motive power the clock had. Fully wound, the spring had enough grunt to run the clock for eight minutes. However, the cam switch closed at seven minutes so the spring never really had a chance to run right down.

The movement needed only a good cleanout and a few drops of light oil in appropriate places to restore it to full working order. The intermittent problem was only dust and dry bearings.

I know nothing of the age or history of this clock but it must have been made some time just before electronics took over time keeping. It was a valiant attempt to make a battery powered clock and it works very well indeed (if one can ignore the self-winding buzz every seven minutes).

And last night's stoppage? A flat battery of course! That first D cell had lasted just over 18 months!

As for running fast, that was easily cured by lengthening the pendulum by means of the adjusting screw provided. Unfortunately, someone had made a mis-calculation and I ran out of adjustment before I had the clock properly regulated.

I solved the problem by gluing a lump of lead to the bottom of the pendulum bob. This had the effect of lowering the centre of gravity, thereby lengthening the pendulum without actually lengthening it, if you get what I mean.

Don't know about you but I get a lot of enjoyment playing about with old technology. It doesn't have to be electronic to be interesting. That's it for this month. I'll be with you again next month, if fortune smiles upon me. ea

New products **from Oatley**

Scientific calculator bargains

OATLEY ELECTRONICS doesn't usually sell calculators, but company founder and manager Branko Justic is very astute in spotting bargains at company distress and liquidation auctions. That's presumably how he recently acquired a large quantity of Casio scientific calculators, which are now being offered to customers at never-to-be-repeated bargain prices.

The calculators are brand new and in their original packaging, complete with instruction manual and standard protective pocket pouch. They are also fitted with batteries, but the condition of these cannot be guaranteed. The calculators themselves have a 30-day guarantee, but this is void if they are physically damaged after purchase.

One model which should be of particular interest to EA readers is the Casio fx-350D, a popular model with high school, TAFE and university students.

The fx-350D handles parenthesis and memory calculations, provides *pi* as an 8-digit constant, provides an accuracy of +/-1 in the 8th decimal place, and has an LCD display with suppressed leading zeroes for readout clarity. It operates for approximately 750 hours from two LR-44 button cells. Oatley has a large quantity and is offering them at the exceptionally low price of only $15 each, or $13.50 each when purchased in quantities of 10 or more.

The other model of likely interest for EA readers is the Casio fx-D400, also very popular with technical users. This model has a 16-digit dot matrix LCD display capable of displaying alpha characters, and offers a calculation range of $+/-1 \times 10^{99}$ — $+/-9.999999999 \times 10^{99}$ with 12-digit accuracy on most functions. It provides all of the functions and facilities of the fx-350D plus nine value memories and an answer memory; decimal-sexagesimal conversions; permutations and combinations; eight types of engineering multiplier symbol calculations; and expanded statistical functions, including regression and correlation coefficient.

The fx-D400 runs from a single LR-44 button cell for approximately 2000 hours of continuous use. Oatley again has a large quantity of this model and is offering them at the very low price of $26 each.

Thirty-day credit accounts can be offered to educational institutions and government departments wishing to order quantities of these calculators — minimum order value $70, and an official purchase order number is required. A total packing and postage fee of $7 applies for all orders of up to 20 units, to anywhere within Australia.

For more information contact Oatley Electronics, PO Box 89, Oatley 2223; or ring (02) 9584 3564, fax (02) 9584 3561, or email to **sales@oatleyelectronics.com**.

Speech Recognition software bargains

IF YOU'D LIKE to try out using speech recognition software on your Windows-95 equipped PC, there's now a way of doing so at exceptionally low cost. Oatley Electronics is currently offering two different 'software kits' which include IBM's popular speech recognition software, at prices far below what you'd pay elsewhere. The IBM Voice Type 3.0 kit provides the software (including Voice Type 3.0, IBM AntiVirus 2.5.2 and the Jungle Book) on CD-ROMs, a user manual and installation guide, and a slimline omnidirectional microphone with alternative bases for adjustable desktop or monitor-top mounting. The microphone lead is terminated in a stereo 3.5mm plug compatible with the majority of PC sound cards. Minimum hardware requirement is a Pentium 90MHz CPU or better running Windows 95, 16MB of RAM, 38MB of hard disk space and of course a suitable sound card. The price of this kit is only $22, plus $7 for packing and postage anywhere in Australia. The other kit is the KTX VoicePack, which provides software (including IBM Voicetype Simply Speaking 3.0 for Windows 95 on CD-ROM plus IBM AntiVirus 2.5 and Lotus Organiser 2.1 on floppy disks), user manuals and installation guides, and an Andrea noise cancelling headset which provides both an earphone and a very slim microphone. The headset cable is terminated in dual stereo 3.3mm plugs, compatible with most PC sound cards. The price of this kit is only $27, again plus $7 for packing and postage within Australia.

Further information is available from Oatley Electronics at PO Box 89, Oatley 2223; or phone (02) 9584 3564, or email to **sales@oatleyelectronics.com**.

BY JEAN BAPTISTE CATTLEY

Do you really want ME? Get the GIMP instead...

ME break. Me fix?

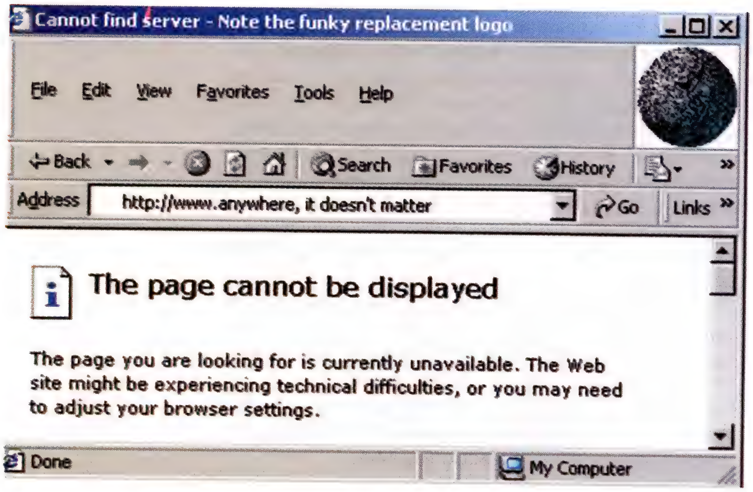
I have an extra parallel port card in my computer, it requires a line to be inserted in the CONFIG.SYS file. When Windows ME is run, the CONFIG.SYS file is renamed to CONFIG.BAK. and an empty CONFIG.SYS file is inserted into C:\ root directory. This also happens to AUTOEXEC.BAT if it is edited.

Other programs have inserted entries into AUTOEXEC.BAT Ok. It seems that programs with entries in the Registry are able to make changes to AUTOEXEC.BAT and CONFIG.SYS, but nothing else. Any ideas? (James Norton, by email)

Oh dear. You went and upgraded, didn't you? Well, welcome to the brave new world of pain that those nice people at Microsoft have devised for you. (You must have heard the joke — 'Whip ME, beat ME, Windows ME!')

Windows Millennium Edition allows you to add some very limited commands (setting environment variables only, I believe) to AUTOEXEC.BAT, and that's it. CONFIG.SYS is right out, so basically... Tough. Windows ME is another step closer to NT, and the real-mode support is pretty much nonexistent.

*'**The page cannot be displayed**'. Who cares? you're supposed to be looking at the natty graphic in the upper right corner of the window...*



http://www.anywhere, it doesn't matter

The page cannot be displayed

The page you are looking for is currently unavailable. The Web site might be experiencing technical difficulties, or you may need to adjust your browser settings.

If you can't get Windows to support your parallel card by itself, then you basically have three choices: 1: get onto the manufacturer, and see if they have written any windows drivers. 2: learn to live without it, or 3: go back to Win98.

I know, I know, it's not good enough, but that's the consumer OS market. If you want to dual-boot to a DOS environment (and you have a 98 CD), check out **www.mvpdts.fsnet.co.uk/WinME.htm**. — beyond that, I'm afraid I can't help you.

I've been using Win2k for a month or two, and if you think ME is annoying when it comes to getting in the way of what you want to do, wait until you see 2k. I have a Win2k notebook that got used to test the network connection at a site — I changed its IP address and did a ping, as you would, and that worked fine. Trouble was, a couple of boots later, the box realised it was no longer on the same network as its domain controller... It demanded that users log in locally — and I had forgotten the local administrator password, having never used it since the initial install. The only option was to format and reinstall — thanks, MS.

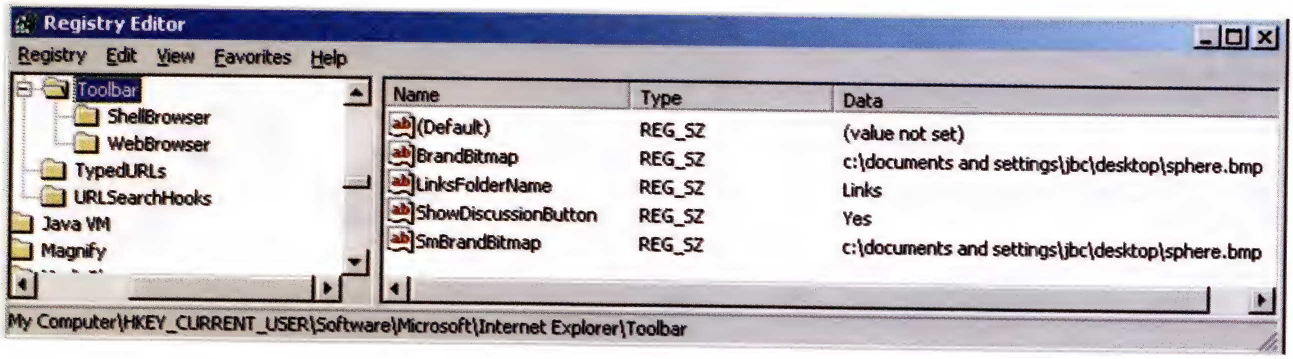
The hardware support for older devices under Win2k is shockingly bad, too and the potential for hacking around problems is virtually zero. It's almost as bad as being forced to use a Mac! (But then of course, Macs *work*, which you must admit is a pretty redeeming feature)

Personally, I get claustrophobic in the terribly limited hands off-style Windows environment after a while, so I always try to stay within reach of a Linux (or, at my day job, SCO UnixWare) box. This isn't a solution for everyone, but hey, it's easier than carrying a sawn-off shotgun around with you. You go through so many computers that way...

No logo

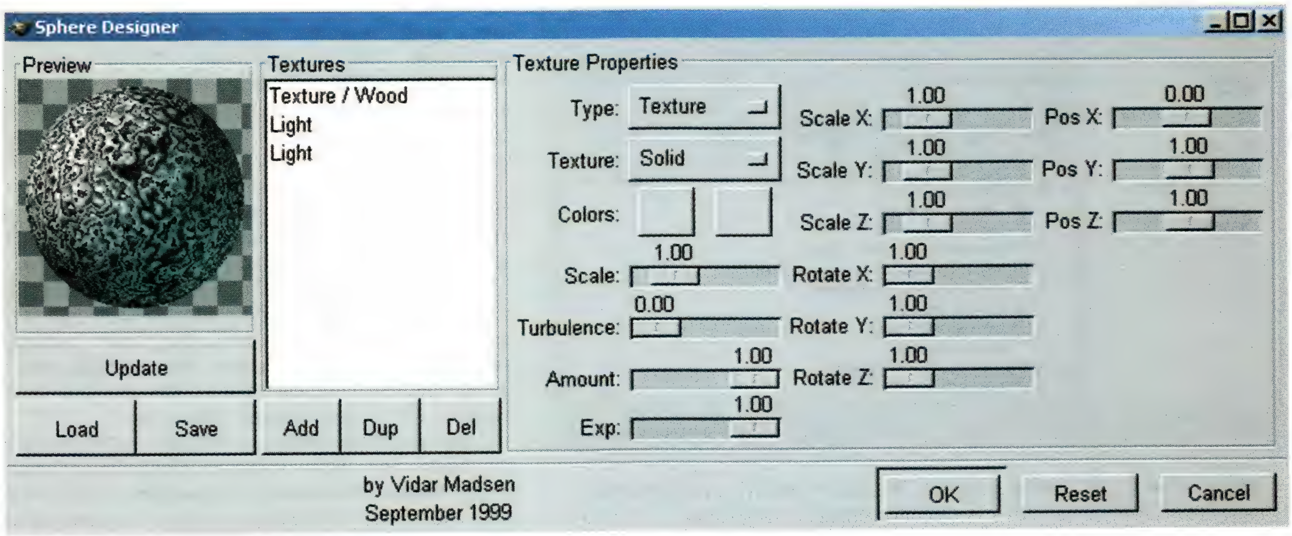
After I tried out a special offer from an ISP, the little logo in the corner of Internet Explorer has changed to

__Below__ is the Registery entry to change to personalise your own browser



Name	Type	Data
(Default)	REG_SZ	(value not set)
BrandBitmap	REG_SZ	c:\documents and settings\jbc\desktop\sphere.bmp
LinksFolderName	REG_SZ	Links
ShowDiscussionButton	REG_SZ	Yes
SmBrandBitmap	REG_SZ	c:\documents and settings\jbc\desktop\sphere.bmp

My Computer\HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\Toolbar



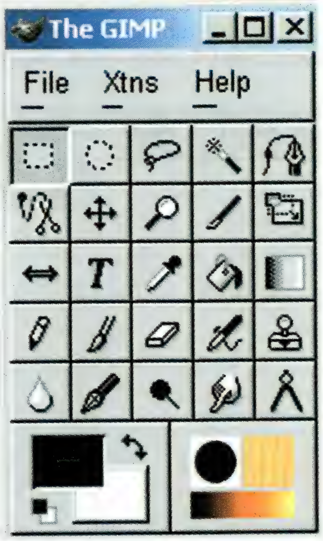
Texture / Wood
Light
Light

Texture Properties
Type: Texture
Texture: Solid
Colors:
Scale: 1.00
Turbulence: 0.00
Amount: 1.00
Exp: 1.00
Scale X: 1.00
Scale Y: 1.00
Scale Z: 1.00
Rotate X: 1.00
Rotate Y: 1.00
Rotate Z: 1.00
Pos X: 0.00
Pos Y: 1.00
Pos Z: 1.00

by Vidar Madsen
September 1999

There's that sphere again *– this time in the GIMP image editor.*
It has all the features of Photoshop, and is a lot cheaper – like, er, free.

the company logo. I've uninstalled their software, but the logo is still there! Can you please tell me how to get rid of it? (P. Hickman, by email)
This bugs me. They're selling you the *connection*, not the browser, yet they try to stamp their brand on IE — the gall of some companies! They certainly don't want to take responsibility for the myriad of little bugs and security holes included in Internet Explorer, but they don't mind the... Sorry, I'm ranting again.



To get the nifty spinning globe back again, run Regedit from the Run menu, browse to HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\Toolbar, and delete the BrandBitmap and SmBrandBitmap entries. If they've gone and changed the window title as well, go to HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\Main, and delete the string value labelled 'Window Title'. Reboot, and you'll, back to nice, minimalist, standard IE.

Get the GIMP!

If you've ever dealt with digital imaging, you'll know that there is *one* image-processing application in the world, and that application is Adobe Photoshop. The publishing industry worldwide uses Photoshop, and there's virtually nothing you can't do with it. Dozens of professional, high-quality filters, support for just about every filetype in the world, multi-layer editing, channel decomposition - everything you could ever want.

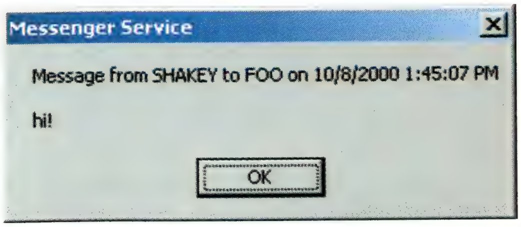
Among all these marvels, there's just one feature you don't really want: the price. At $1200, it's way too expensive for the average user. It's even a tad pricey for the moderately-well-off user, as well. Luckily, there's a rather nice alternative, called the GIMP.

A long-time favourite of Linux users worldwide, the GIMP (Gnu Image Manipulation Program) is a remarkable application, providing nearly all of the functionality of Photoshop, without the scary pricetag. Better yet, it's been fully ported to Win32, which means you can use it in Windows without having to move your work over to your Linux box. (What? you don't *have* a linux box? Shame on you! Redhat 7 is out, go and get it!)

The GIMP has some features you won't find in Photoshop, as well - such as the ability to write your own filter combinations and actions, using a built-in scripting language. We're talking about some incredibly powerful software here, and being released under the Gnu Public License, it's completely free. Go now and grab a copy (it's 10MB, so it might take a several weeks over a dial-up connection) from **www.gimp.org/~tml/gimp/win32/downloads.html**.

Dinner's ready!

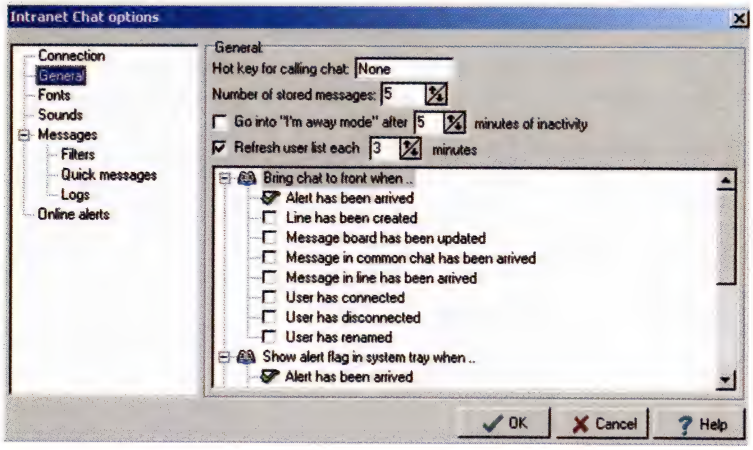
I have a small network set up between the living room and my son's bedroom so we can both use the internet and share the printer. Is there a way I can talk to him over the network? I can send him mail, but it's slow, it doesn't work if I'm not logged onto the internet and he never checks it anyway. Is there a way to just make something come up on his screen? (I. Bonno, by email)
You can use the inbuilt messaging facility in Windows to send short messages, but there's a catch. Unless you're using NT, you have to use



Message from SHAKEY to FOO on 10/8/2000 1:45:07 PM

hi!

This is *the sort of thing you wanted, isn't it? Thought so.*



General
Hot key for calling chat: None
Number of stored messages: 5
☐ Go into "I'm away mode" after 5 minutes of inactivity
☑ Refresh user list each 3 minutes

Bring chat to front when ..
- ☑ Alert has been arrived
- ☐ Line has been created
- ☐ Message board has been updated
- ☐ Message in common chat has been arrived
- ☐ Message in line has been arrived
- ☐ User has connected
- ☐ User has disconnected
- ☐ User has renamed

Show alert flag in system tray when ..
- ☑ Alert has been arrived

***Intranet Chat** is just the ticket for working over Intranets – like the one at work. Now you can flirt with someone in Accounts without sending 30 emails a day...*

Winpopup.exe, located in the Windows directory.

This is effective enough, but you have to keep the program open in order to receive messages — it takes up valuable taskbar space, and is all too easy to close. Also, the interface isn't exactly a masterpiece of GUI design, more like a mail client than a chat utility... All in all, it's a bit of a pain to use.

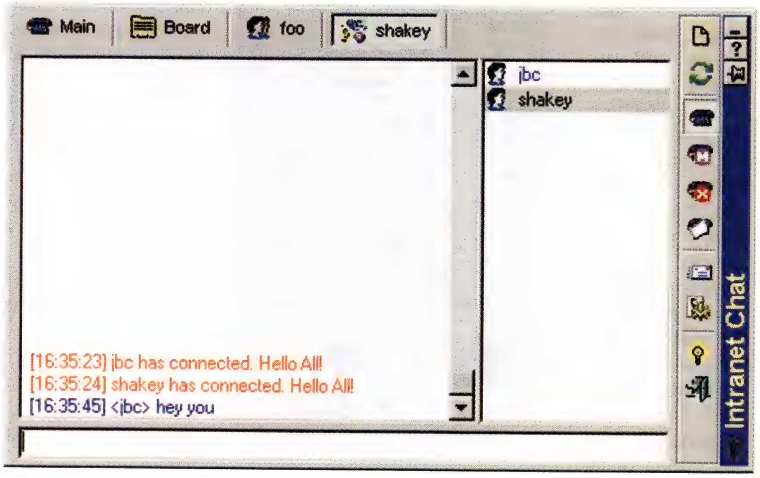
NT users don't need Winpopup, as the Messenger service does all the work behind the scenes, popping up messages as alert dialog boxes on your screen. (You can send messages on NT by typing NET SEND message from the command prompt.) Even then, it's a little clunky to use, and certainly not worth upgrading to NT for. Basically, we need a better solution.

If you were on the internet most of the time (there are people who aren't?) your best bet would be to use one of the many instant messaging services out there, such as MSN Messenger, AIM, or gods forbid, ICQ. (ICQ has , in my humble opinion, perhaps the single most annoying interfaces on the planet, complete with cutesy typewriter sounds, stock tickers, and god knows what else.) Alternatively, you could log onto IRC (Internet Relay Chat), using one of the many IRC clients available. The only good one out there is mIRC, available from **www.mirc.com**. It's $20 shareware, but it's full-featured, and a joy to use.

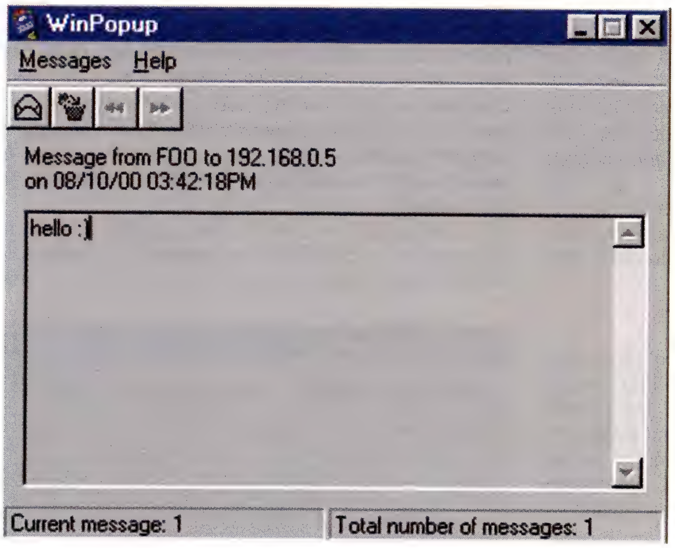
Unfortunately, none of these solutions are of use to you while you're offline. (you *could* run up an IRC server such as Unreal3.0 from **www.nonags.com/nonags/servd32.html** on your machine, then both log onto it using mIRC, but I suppose that's a little geeky for most people... Me? A geek? Never! Well, a bit...)

What you really need is a simple *intra*net chat utility such as, well, Intranet Chat v1.09 from **http://vnalex.tripod.com/e_index.htm**. This handy little client uses local broadcasting to find other users on the same network, and so requires no dedicated server and no network setup at all for most users.

You just run up the client (or allow it to start at boot), and it hides in the tray until needed. If someone sends you a private message, it will pop up a window, otherwise it stays out of the way (you can also go into 'do not disturb' mode to prevent this if you want).



[16:35:23] jbc has connected. Hello All!
[16:35:24] shakey has connected. Hello All!
[16:35:45] <jbc> hey you



Message from FOO to 192.168.0.5
on 08/10/00 03:42:18PM

hello :)

Current message: 1
Total number of messages: 1

***WinPopup is ok,** but you have to keep it open and it clogs up the Taskbar. It comes with Windows and you don't have to install anything, so it has that going for it, at least.*

If you have more than two users (say for use on a corporate network), you can take advantage of the public, private and 'channel' message modes, which let you make your messages as private or as public as you want or need.

Intranet Chat is small, light, and has a very clean, simple interface, unlike the majority of these programs. It's scaleable from two users up to an entire corporate intranet - it just works. I give it at least an 8 out of 10, and I think it'll do exactly what you want. Oh, and I recommended it, so of course you know it's free. Go get it now. **ea**

LITTLE **LEDS**

FEATURES

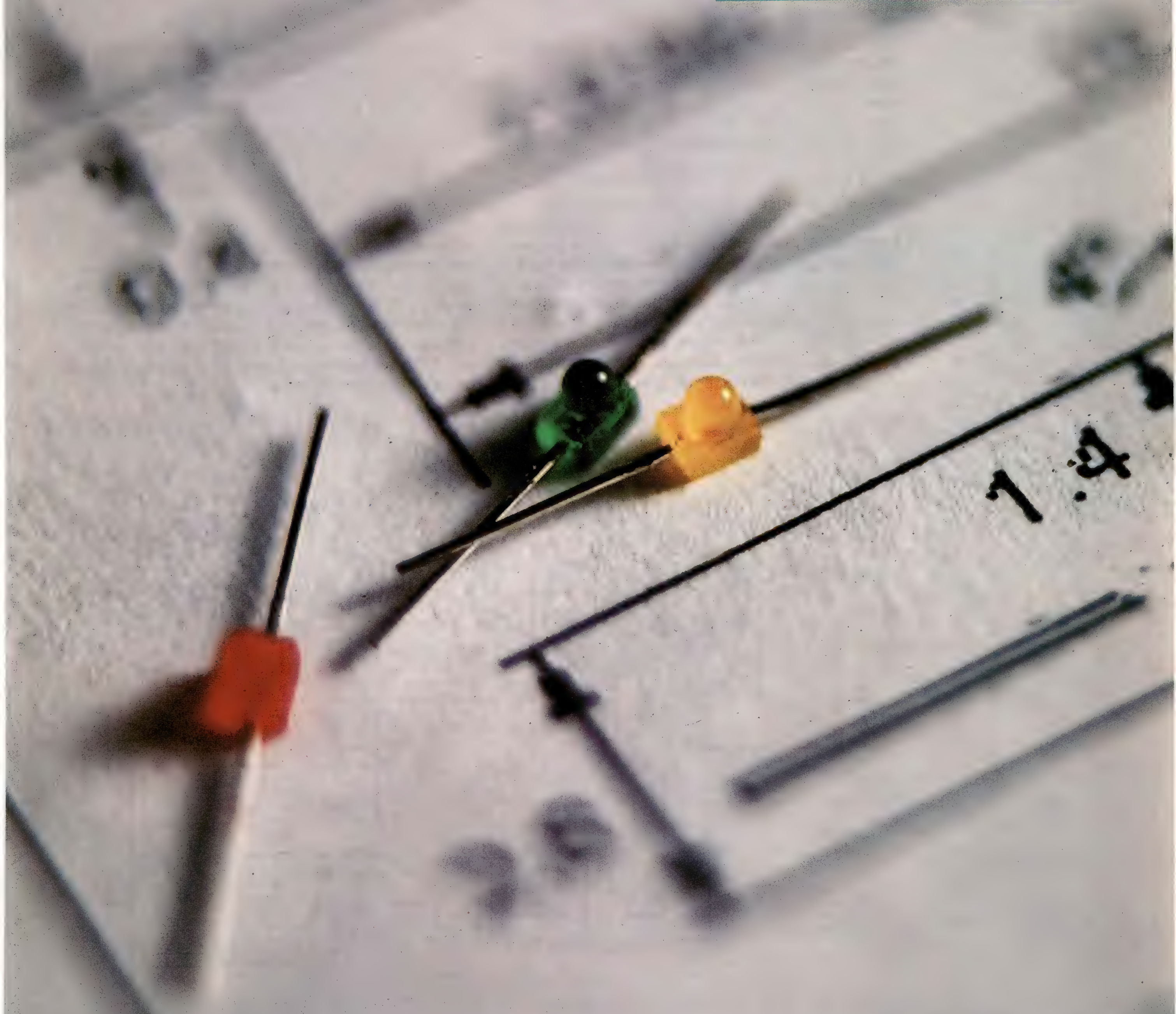
- Very compact – they fit anywhere!
- Reasonably cheap
- Nice high light output
- SMD or 0.1" through-hole lead spacing

SPECIFICATIONS

Total Power Dissipation:	100mW
Forward current:	30mA
Viewing angle:	74°
Physical dimensions:	2.5 x 2 x 2.8mm

SURFACE-MOUNT LEDs are very useful devices, as they can be used in both SMD and through-hole applications. Use them in place of conventional LEDs for that sleek and discrete look, or tuck the odd one away on your circuit board to let you know that everything's operating correctly.

You can buy a bag of 50 little LEDs containing 20 red, 20 green and 10 yellow devices from Dick Smith Electronics for $12.94 (Cat #Z7100). That's 26 cents each — cheaper than conventional LEDs! ea



BY ROGER JOHNSON

The 'better' short wave sets

Most Australian short wave valve receivers were 4/5 superhets with a broadcast band and a single short wave band covering either from 16 metres to 49 metres, or from 13 metres to 42 metres. However Astor and AWA in particular made fine receivers that performed really well...

THE STANDARD DUAL wave radio of the valve era incorporated a dual-wave facility probably more as a gimmick than as a real attempt to provide an adequate and reliable short wave coverage. In 1946 it was estimated that less than 2% of listening time was allocated to short wave listening; but if you had nothing better to do, then a half an hour here and there trying to pick out some of the more powerful programs no doubt provided some enjoyment.

Short wave facilities on the family console radio began to appear from about 1934, and generally speaking from 1935 most manufacturers had a dual-wave model in their range of electric radios. In the early 1930s battery short wave sets had problems with the converter valve (1A6), and it wasn't until the 1C6 came along that performance was any good. Even so, battery dual-wave receivers were not particularly common until the post war era.

The radios of the octal valve era were remarkably similar. The short wave facility usually covered the 16m, 19m, 25m, 31m and 49m bands with practically no band spread capability. A given station was easily detuned by the slightest turn of the tuning control knob. Separation was sometimes very poor, and performance on the 19 and 16 metre bands often dropped off considerably. Daytime reception was often non-existent.

Not only that but 'double spotting' is also quite a problem. This is the name for the phenomenon where the incoming signal is received at two spots on the dial, due to poor image rejection. The unwanted image is twice the IF away from the normally tuned signal (i.e., the other side of the local oscillator), and is heard because of the broad tuning characteristics of the aerial coil. Double spotting is somewhat eliminated with the inclusion of a tuned RF stage.

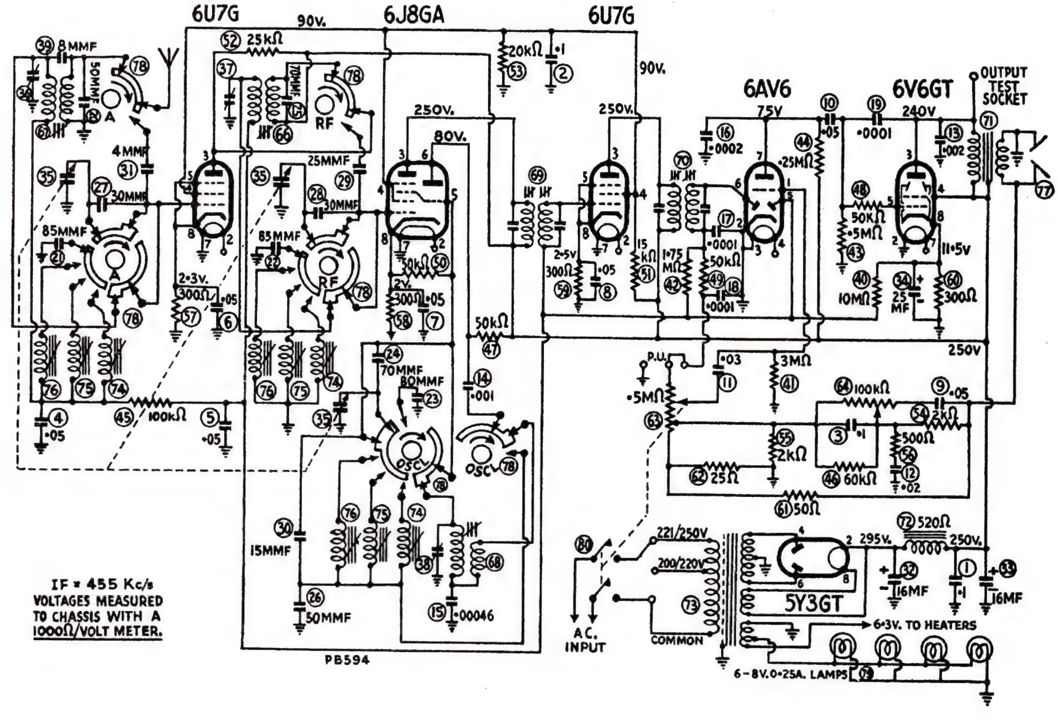


Fig.1: *The circuit for the Astor NS, showing complex band switching – and the fairly elaborate audio amp with its negative feedback.*

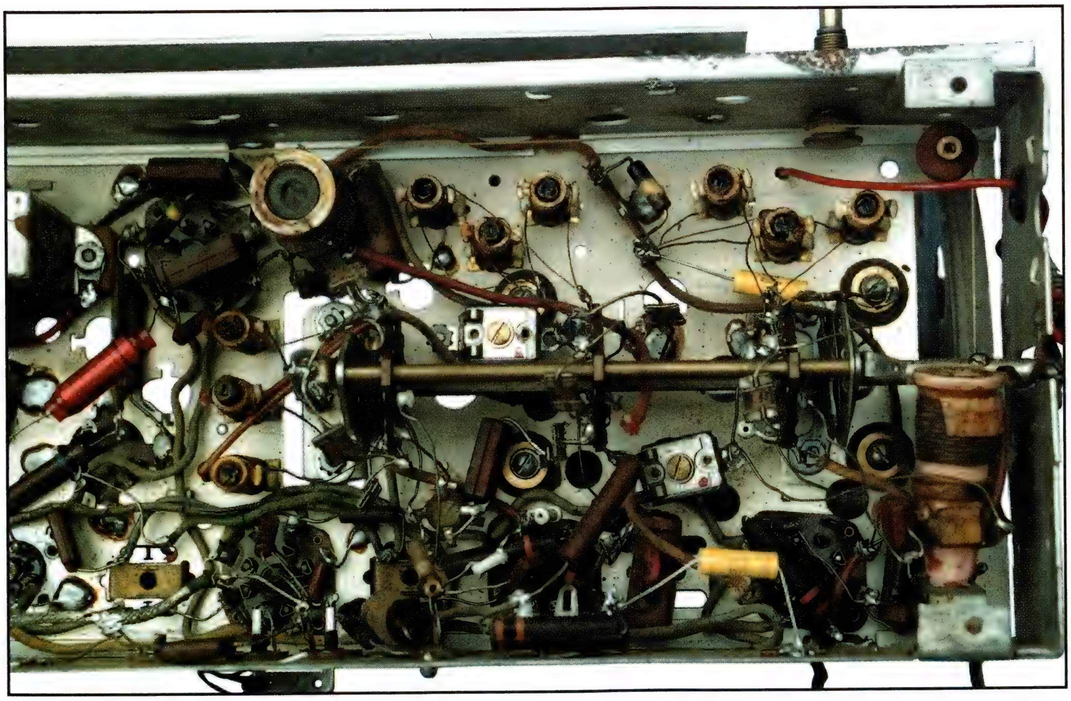


Fig.2: *Underneath the Astor NS chassis, showing the considerable number of coils in the front end circuitry. The bandswitch is also seen, running horizontally across the centre.*

AWA did try to overcome some of the shortcomings of this type of set with a vernier system incorporated into the tuning control. With particularly high gain overall and well designed coils, these radios were probably the pick of the bunch of the 4/5 superhets up until domestic radio manufacturing was ceased for wartime production.

AWA, Healing and Astor in particular also offered two- and three-band radios with an RF amplifier stage, which considerably improved performance.

Astor's model NS

The Astor model NS radio of 1951 came in the familiar 'harbour bridge' cabinet and left little to chance. It included a tuned RF stage, and specific bandspread tuning for the 19, 25 and 31 metre bands. The actual coverage for one full sweep of the dial was 14.9 to 15.5MHz, 11.6 to 12.5MHz and 9.4 to 9.8MHz respectively. This meant that if the frequency of a given station was known, it could actually be tuned instead of guessed at!

The NS also incorporated audio feedback and a comprehensive treble control to facilitate better audio quality, and although it was a table model it had a reasonable 8" speaker to give quite good audio quality. The circuit is shown in Fig.1.

As you can see it's a good example of the use of switches that do more than the wiper just selecting one contact for each position of its travel. We have the one contact continuously selected for more than one position of the switch, and in other applications, adjacent contacts being connected as the switch passes from one contact to the next.

The band switch is shown in the broadcast (BC) position. The antenna is connected to the BC coil primary. The secondary is then connected to the "6 o'clock" position of the lower bank of (78). This wiper then connects to the grid of the RF amp, and the 30pF capacitor (27) is shorted out. The tuning capacitor (35) is in circuit also, being connected directly from the grid to earth. The 85pF capacitor (21) is switched out.

As the switch is rotated in the direction of the arrow, several things happen in the aerial tuning circuitry. Firstly, the broadcast coils are switched out, and the antenna is coupled via a 4pF capacitor (item 31) to the grid of the 6U7-G, and also to the wiper of the lower switch bank. This disconnects the broadcast aerial tuning coil, and connects the 19m band coil (item 74). In so doing, the 85pF capacitor (21) is connected across the tuning gang, and the shorting link for the 30pF series cap (27) is released, connecting it in series with the tuning gang total capacitance and of course in parallel with the tuning coil, from grid to ground.

Almost identical switching occurs at the output of the RF stage, with items 22, 28 and 29 being brought into the tuning circuit in exactly the same manner.

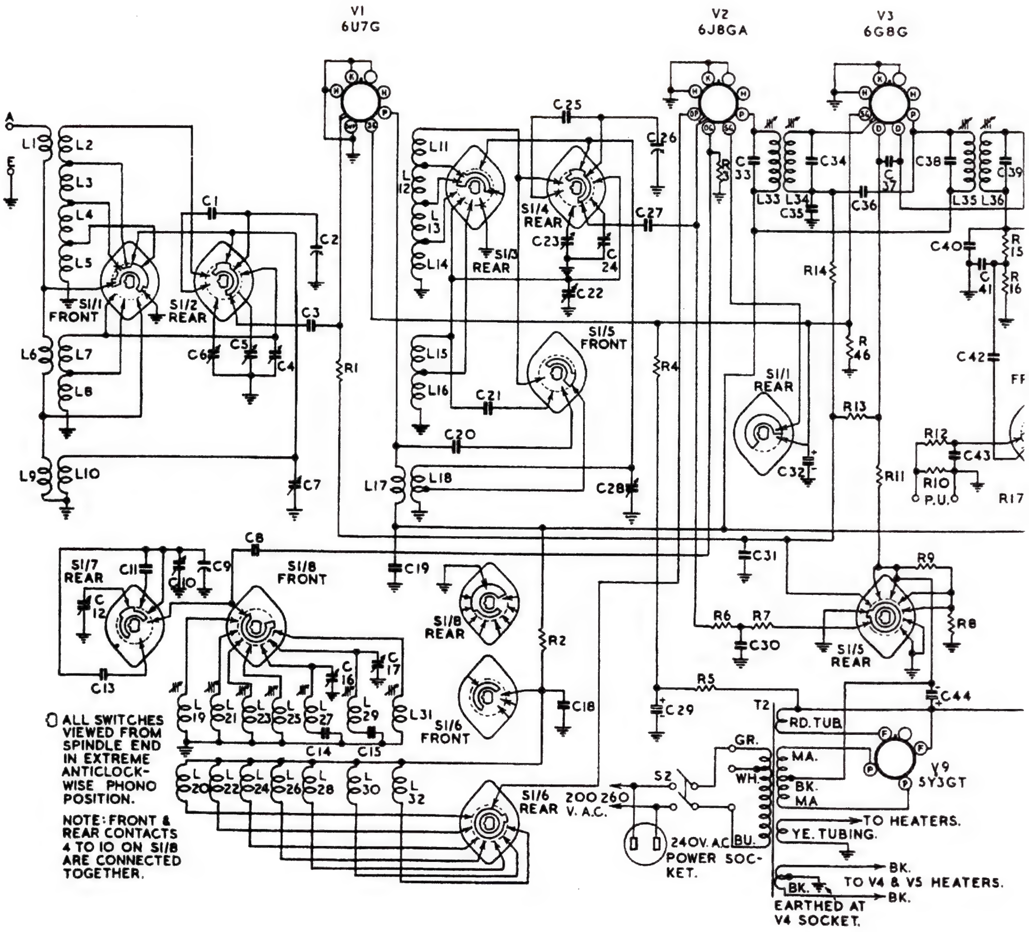
In the oscillator section, with the switch contacts as shown in the BC position, the BC oscillator coil is in circuit in a conventional manner for Astor sets. The 70pF series capacitor (24) is shorted out. When switched to the 19m band, the osc. coil item 74 is connected to the oscillator grid. The 80pF capacitor (23) shunts the tuning gang, and capacitor 24 is now in series with the tuning gang. The 6J8-G plate is now connected via the 0.001uF capacitor (14) to the other end of the Colpitts oscillator coil.

For the remaining bands, viz. the 25 and 31 metre bands, the switching arrangements are identical apart from switching in the respective coils.

Switching complexity

Why the complicated switching? Well, it's the very essence of a good shortwave receiver that the bands aren't crowded, and for the operator to be able to actu-

Fig.3: The front end circuitry used in the AWA bandspread receivers released in 1940. V1 is the RF stage, and V2 the oscillator/mixer.



ALL SWITCHES VIEWED FROM SPINDLE END IN EXTREME ANTICLOCKWISE PHONO POSITION.

NOTE: FRONT & REAR CONTACTS 4 TO 10 ON S1/8 ARE CONNECTED TOGETHER.

ally select a station on a given frequency calibration of the dial. This will not be achieved with the standard 435pF gang connected directly across the regular short wave coil(s), as in the majority of 4/5 superhets.

To achieve the correct tuning, the range must be severely reduced by reducing the effective range of the tuning capacitor. This has been achieved by the connection of the series capacitors 27, 28 and 24 in the Astor circuit. The capacitance of is also significantly altered by shunt capacitors 21, 22 and 23.

In the aerial and RF tuning circuits, the capacitance range is no longer 20 - 420pF. The shunt capacitor alters that to about 100 - 510pF approximately, while the series capacitor reduces this again to an effective tuning range of about 23 - 28.5pF.

The effective figures for the oscillator range would be similar and slightly higher, at roughly 41 - 62pF. Given this range, it is likely that the oscillator is tuned to the low side of the incoming signals.

One other highly significant factor is that the ‘Q’ of the tuning circuits are greatly enhanced because of the high-L/low-C circuit configuration. This gives higher selectivity.

No double spotting

Given the short tuning ranges of this receiver, double spotting is eliminated. Take for example the 19m band, with the tuning range 14.9 - 15.5MHz. If the desired signal was at 15.486MHz, say, the image would be at 15.486 minus twice the intermediate frequency of 455kHz or 14.596MHz — which is clearly outside the tuning range.

Fig.2 shows a photo of the underside of the Astor NS chassis, showing both the coils and the wave-change switch with its widely separated wafers.

By the way to align one of these receivers a very accurate signal generator is required, as well as a magnifying glass and the detailed instructions given in the *Official Australian Radio Service Manual* for 1951 (Vol. 10, p50). The coils are slug tuned for even greater efficiency, and great care is needed.

To tackle an alignment using one of the humbler service oscillators is asking for trouble. If no signal generator is available, with an appropriate alignment tool, try listening for Radio Australia on its announced frequency, and *fractionally* adjusting each of the three slugs for the chosen band for maximum output and dial calibration. A fraction of a turn means just that — **no more than a few degrees** each side of the existing position. After that, put your hands in your pockets and go and make a cup of tea! The alignment is complete.

AWA bandspread series

AWA released its bandspread series in 1940, in both battery vibrator and electric models. The essential elements of the front end were essentially the same: viz. a tuned RF amplifier, mixer/oscillator and a single stage of 455kHz IF amplification.

The battery vibrator model used a more elaborate audio system utilising a type 1H4-G transformer coupled to a type 1J6-G class B triode push-pull output.

(Continued on page 97)

INFORMATION CENTRE

BY PETER PHILLIPS

The Olympic flame problem, whether to use tri-colour LEDs, project enquiries and more

Our letters this month include discussion on colour blindness and front panel design, the Olympic flame problem and a 12THz processor! We also look at several recent EA projects, including the November 1997 Video Enhancer and a LED Level Meter from the May 2000 edition.

Colour blindness and tri-colour LEDs

I raised the issue of colour blindness and front panel design in the September column. The following letter is from a colour blind electronics design engineer who makes a number of interesting points about an issue that affects millions of people around the world...

Thank heavens someone has finally noticed that tri-colour LEDs are completely useless to 7% of the male population (myself included). I'm an engineer and I wouldn't dream of using tri-colour LEDs in my designs, as it's simply bad engineering. If their use was ever related to causing an accident, I imagine the manufacturer could face a huge law suit.

When LEDs are used in traffic lights, rather than use a pure colour, it's common practice to install a number of LEDs that are just either side of the main wavelength, to allow colour blind people to see the colour more clearly. In Nature, one almost never finds a pure colour such as that produced by LEDs, and these 'side bands' dramatically improve colour perception for people such as myself.

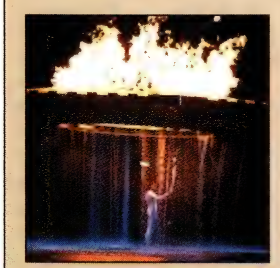
By the way, the term colour blind is misleading, as achromatic vision (no colour at all) is very rare. Most people just have trouble with a couple of wavelengths, meaning the problem often goes undiagnosed. (Shaun O'Brien, Gold Coast, Qld)

I'm very pleased to hear from a person such as yourself Shaun, as the issue of colour blindness has been a hobby horse of mine for years. When I first entered the workforce I intended undertaking a career in mechanical engineering. However, another trainee in the same intake who had chosen electrical engineering was found to be colour blind during the compulsory 'health check'. Our positions were swapped by the employer and since then I have never looked back.

The Olympic flame

I'm sure many (if not most) readers will have watched the Sydney Olympics opening ceremony. So what went through your mind when the gas burner shuddered and remained stationary, when clearly it should have started its ascent? Shaun O'Brien's reaction might be typical...

Perhaps you could do a story on why the Olympic flame got stuck during the opening ceremony. I was mortified when it jammed, as it made Australian engineers look incompetent in front of 3.5 billion people. I for one would like to know how such an unthinkable error could be allowed to occur.



To me, this was a case of Murphy's law: "if it can happen, it will, and then at the worst possible time". According to news reports, the system was tested around 3.30am the previous night, which should have ensured that Murphy and his wretched law would stay away. And who among us has not been caught out by Murphy?

Given the success and magnitude of the whole opening ceremony, I doubt the term 'incompetent' would have been in many people's minds when the gas burner shuddered and appeared to be stuck. Most engineers are aware that all the testing in the world is no guarantee it will be "right on the night'. And, if a system passes all tests, there's not a lot more that can be done to ensure its reliability.

Still, it would be very interesting to know just what happened. Perhaps an engineer who worked on it might enlighten us, or even fill us in on some of the many engineering aspects that drove these games so successfully.

Kit for Property Minder project

***I am writing about the Property Minder project in the April 2000 issue. My group has decided to build this device as our school project, but we are not able to get the parts. I would prefer to buy a complete kit, so could you advise me where I can purchase a kit, and whether it's still available.* (Aneesh Ram, Suva, Fiji Islands)**

Is it states in the article Aneesh, kits for this project are available from Oatley Electronics, PO Box 89, Oatley NSW 2223, Australia. The kit is catalog number K130, and sells for AU$28.00. You can email Oatley at sales@oatleyelectronics.com, or visit their website at www.oatleyelectronics.com.

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So my interest in the topic is rather personal and I'm always on the lookout for front panel designs that discriminate against those with a colour perception problem. For instance, I recently watched a colour blind person try to use a fax machine. The instructions said 'press the green button', but he could not differentiate between the green and red buttons, and all he achieved was a copy of the fax he wanted to send.

To eliminate the problem simply requires designers to be aware of it. Colour on a front panel looks nice, but if its use causes confusion for those with a colour perception problem, the design is unsatisfactory. End of story. What do other readers think?

Wrong address for Proxomitron program

You probably know by now that your link/address to the Proxomitron program in the computer clinic should be http://proxomitron.cjb.net. Keep up the good work. (Cameron Budge, email)

Thanks Cameron, web addresses have a nasty habit of being changing from time to time.

ATX motherboard in a car

The following letter is in reply to a reader enquiry (Kervin, email) in the August column. Kervin wanted to know if there is a power supply available that would let him run an ATX motherboard in his car.

Jenlogix (Auckland NZ) used to sell a 65 watt 12 or 24 volt input to ATX mother board power supply. These were available in 1998, but are not cheap at around NZ$200 to $300. We buy 24V DC versions from this company. Your reader might also try Priority Electronics, Hornsby NSW, phone (02) 9482 2999. (Alex, NZ)

Thanks Alex, I hope Kervin is reading this. As well, there could be others interested in running such a board in a vehicle. I haven't checked out Priority Electronics, but it seems a good place to try.

DSO adaptor kit

Do you know of any supplier who has a kit for the PC-Based DSO adaptor Mk3 (Oct/Nov '98)? I've checked out Altronics, Jaycar and Dick Smith, but they don't seem to have it. (Rob Crawford, email)

Sorry Robert, if they don't have it, then I don't know

Nov 97 video enhancer/stabiliser explained

I recently got someone to make up the November 1997 Video Enhancer and Stabiliser project from a Jaycar kit. The unit is working well, but I have a few questions I'm hoping you can answer. First, which of the two front knobs is the enhancer? Secondly, what is meant by the terms 'Peak Frequency' and 'Hi Peak' and what do the numbers 2.0, 2.5 and 3.0 stand for in regard to the peak frequency, and the numbers 0, 5 and 10 for the hi peak range? Also, what is meant by the term 'flat' in regard to the peak frequency?

As I didn't actually build the kit, I don't quite know how to get proper use out of it, and as such, I'm not sure how to confirm whether the enhancer is working. How can I check this? Finally, what is the best setting for both front panel controls when dealing with a normal video signal? I hope you can give me some advice, as the instructions are mainly for those building the kit, not for users of the project. (Tony Crossley, email)

This device might seem complex Tony, but it performs a relatively simple process. Basically, the enhancer section boosts (or amplifies) part of the video signal to improve its clarity, and the stabiliser section removes unwanted signals from the video signal that otherwise tend to cause stability problems.

The unit enhances the video signal by boosting its higher frequencies. This is similar to enhancing a dull sounding audio signal by adjusting the amplifier's tone controls to give the signal more treble, thereby adding a degree of 'brightness' to the sound. The same thing applies to a video signal, except you improve the sharpness of the picture. The enhancer part of the unit involves both front panel controls, which together let you select how much enhancing you want, which depends on how bad the incoming video signal is.

In this project, the two front panel controls let you select the part of the video signal you want to enhance (Peak Freq control), and by how much (Hi Peak control). A good quality video signal extends who will. It was a popular kit at the time, but obviously demand has dropped off, and they no longer stock it. You can of course order the artwork and article from us here at EA, and companies like RCS Radio will sell you the PCB if you want to build it 'the old-fashioned way'.

Is there really a 12THz CPU?

I recently saw an article on the internet regarding a new chip being developed. It's called a "transfer capacitor" and is allegedly capable of running at 12 Terahertz. Is this thing for real or what? It's reputed to be up and running! (Bill McGuinness, email)

You've been the victim of an April fool's joke Bill, perpetrated by an American electronics magazine. The fastest CPU running at the moment is Intel's P4 processor, at 2GHz — but there will probably be something faster out there by the time you read this.

16 step LED level meter

The May 2000 edition describes a circuit called a LED Level Meter 2. I have connected the circuit as shown on page 88, with the exception of doubling the circuit, thereby using 16 LEDs, four LM324s etc. The circuit works fine except that the last LED at the top of the string does not light up. The input voltage at the last opamp exceeds the comparative voltage, but the output from the opamp is 0V and therefore the LED does not light. I have swapped the opamps and the same thing happens. Therefore it appears the components are ok, and my circuit has a problem. Can you offer any suggestions? (Graeme R. Campbell, email)

This circuit operates on the principle of lighting one LED only (except the bottom LED) by driving each LED with two opamps. A LED lights only when the opamp driving its anode is positive and the next opamp down (to LED cathode) is at 0V. However you say that the input voltage (pin 13) at the top opamp exceeds the reference voltage at pin 12. Under these conditions, the opamp output voltage will be 0V, as you've experienced. To make the output voltage high, the voltage at pin 12 must exceed that at pin 13.

Let's assume Graeme that you've reported the facts incorrectly and that the input voltages have values that should drive the top opamp's output high, as in Fig.1. Under these conditions, if the output voltage is 0V, then there's either a faulty opamp or a wiring error. Given that you've tried a different opamp, perhaps it's time to look for a wiring problem. Here you have two possibilities: an open circuit at the inputs, or a short circuit at the output.

First confirm that the voltage at pin 12 exceeds that at pin 13. However, check these voltages at the IC pins. It's amazing how often an IC socket exhibits an open circuit. If all is well, switch off the supply voltage and remove the IC from its socket. Then see if you get a low resistance reading between the output (pin 14) of the suspect opamp and ground. If so, there's your problem.

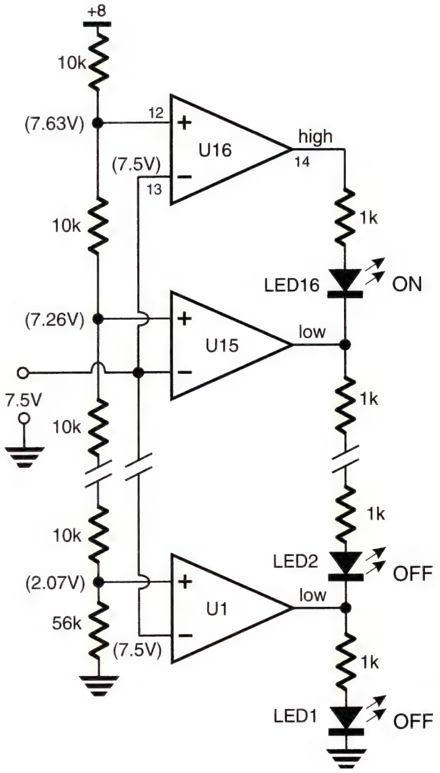


Fig.1: *Part of a 16 level LED voltage indicator, showing the conditions that should light LED 16.*

Other than these suggestions, there's not a lot more I can offer. Your 'doubled' circuit should work, giving, according to my mathematics, a reference voltage at each non-inverting (+) input that drops by around 0.37V as you work down the chain, assuming you've used an 8V regulator as shown in the circuit.

The theoretical values are shown in Fig.1, which assumes 16 opamps and the related potential divider circuit for the reference voltage. Note that if the input voltage exceeds the reference voltage at U16, all LEDs, including LED16 will be extinguished. **ea**

up to 5MHz or so, but a poor quality signal might only go to 2MHz or less, making the picture look dull, or 'soft'.

So, to sharpen a dull picture, select one of the three frequencies: 2.0MHz, 2.5MHz or 3MHz. This setting determines the point at which boosting, or enhancing occurs, rather like the sliders on an audio graphic equaliser, where each slider represents a frequency, and the position of the slider determines the degree of boost. In the enhancer, the amount of boost is set by the position of the Hi Peak control. The numbers around this control (0, 5 and 10) give a guide to the amount of boosting, where 10 represents the maximum boost and 0 the minimum.

The best settings depend on the input signal quality, and you simply adjust the two controls to give the best effect. However, the enhancer can't magically fix a poor picture, it will only improve the edges of the objects in the picture, giving a degree of sharpness.

If the incoming signal is pretty good, select the 'flat' position, which means the signal is not enhanced at all, regardless of the setting of the Hi Peak control. Note that the stabiliser section of the project has no front panel controls, and is always in operation. Its settings are done by adjusting the small potentiometers on the printed circuit board, and should be set as described in the article.

The easiest way to check if the stabiliser is working is to make a copy (for personal use only!) of a Macrovision-encoded tape — all Disney tapes for example are copy protected in this way. If the copying process is successful, then the stabiliser part is working. On the other hand, if the copy has varying brightness or the picture rolls, the stabiliser is not working.

To check the enhancer part, feed a video signal through the unit and adjust the controls to see the effect. Select say a 2MHz peak frequency, then when you wind the peaking up to 10, you should see the image edges start to repeat a little, indicating there's too much boost.

$10 WONDERS

BY OWEN BISHOP

Party hats

Party season is almost upon us and we really have something to celebrate this year - the beginning of the 3rd millennium! Last year we had all that worry about Y2K (still remember that now?), but this year we can sit back, relax, and really have a party. And what better way to feel partyish than to don a party hat. Here is a hat that will make everyone look at you twice (at least!).

PARTS LIST

resistors

(0.25 W, 5% or better)

R1	27k
R2	270k
Rb1-Rb5	see table
Rs1-Rs5	see table

capacitors

C1	220nF polyester film

semiconductors

D1-D5	LEDs, possibly more
IC1	CMOS 4060 14-stage counter/divider with clock
Q1-Q5	BC548 NPN transistor

miscellaneous

Stripboard (13 rows x 22 holes), 7 x 1mm terminal pins, 9V battery clip, crocodile clip, solid-core hook-up wire, light duty hook-up wire), card and other materials for making the hat.

THIS MONTH we're presenting a party hat, and tere will be another, but entirely different hat next month. As you'd expect from EA, these are electronic hats, each one incorporating a free-running electronic circuit to produce a dazzling display. We have two designs for this, so that you and your friend can have their own individual style of ten dollar titfer.

Binary display

This is used for the pointed hat on the left in the photograph, though you can, of course, make your hat any shape you like. It has five LEDs (or you can have five groups of LEDs) and it runs through a binary sequence from 0 to 31, repeating indefinitely.

It starts with all the LEDs off (binary 0), then, with much flashing and jumping about, they eventually all come on (binary 31). The circuit is based on a binary counter, the CMOS 4060 IC (Fig.1). It has its own built-in clock (R1, R2 and C1) which simplifies the construction.

With the values given, the clock runs at about 75Hz, which is divided down in four binary stages to give the output from pin 7 at approximately 5Hz. We also take outputs from stages 5 to 8, each stage having half the frequency of the one before it.

Each output drives a transistor switch, of which only the first is shown in Fig.1. Each switch can drive a single LED as shown, but it can drive more. Extra LEDs are wired in parallel as in Fig.2, but as the number of LEDs is increased, we must modify the values of the series resistor Rs and the base resistor Rb in each switch. The table gives suitable standard values, based on a current of 15mA for each LED:

No. of LEDs	Total current (mA)	Rs (ohms)	RB (kilohms)
1	15	390	56
2	30	220	27
3	45	150	18
4	60	100	15

Part of the fun of making the hats comes from designing the hat itself and the layout of the display. Most newsagents sell sheets of thin card in a wide range of colours and this is ideal for making hats. There are dozens of possible shapes of hat: cornets (like the Princess hat in the photo), crowns, Dolly Vardens, top hats, bicorns (pirate's hats), space helmets, shakos, kepis, mitres,

There is also plenty of scope for choosing what kinds of LED to use. Nowadays these come in a wide range of colours: red, orange, yellow, green, blue and even white. We used the more or less standard 5mm LEDs in the cornet, and made up the display from red, yellow, green and orange LEDs. There are also several sizes; the 10mm jumbo LEDs could look rather impressive.

In addition, there are several shapes too: round, triangular, rectangular. The effect of the display depends on the layout of the LEDs — for the Princess hat, we set out the LEDs in a row in order from D1 (at the bottom) to D5 (at the top). The display starts as blank then gradually build upward to a full row of five glowing LEDs.

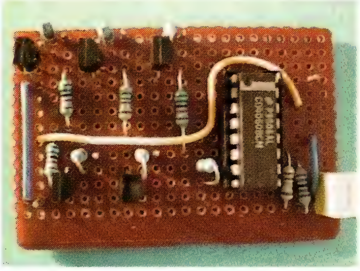
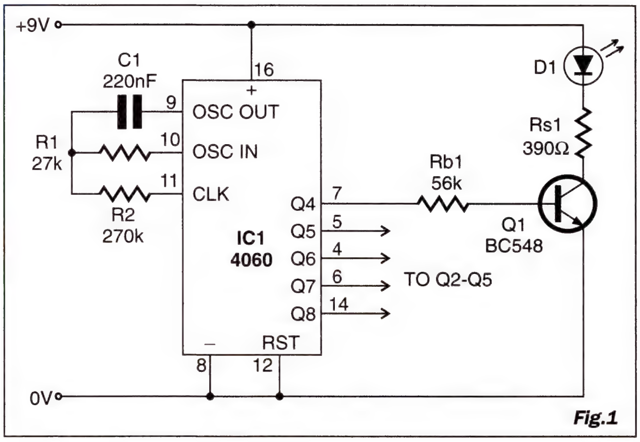


Fig.1: Just one chip doing all the work, and a transistor driving the LED. That's all you need, along with a couple of parts for the IC's built-in clock.

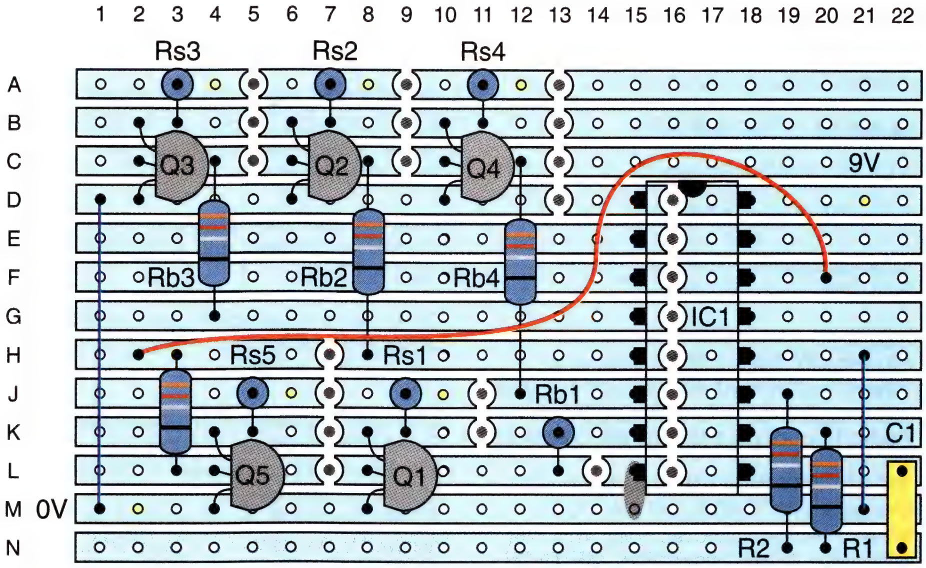


Alternatively, you can scatter the LEDs in any order and obtain a more random, sparkling effect.

Construction

The circuit is built on a small rectangle of stripboard, with a compact arrangement of the components (Fig.3). We have provided five transistor switches, each of which may switch up to four, possibly more, LEDs. First mount the socket for the IC, then solder in the two resistors R1 and R2, and the capacitor C1.

Also, solder the wire link connecting pin 12 to the 0V line. At this stage, test some of the output pins of the IC, using a voltmeter. The output at pin 7 should oscillate at about 5Hz, while pin 14 runs at about 0.4Hz.



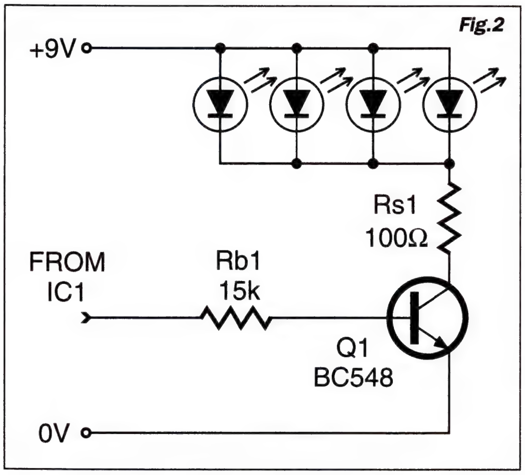


***Fig.2**: Above is the compact stripboard layout, while at left is the way to drive a number of LEDs at once. Be sure to check with the table on the other page for the correct resistor values to use.*

Remove the IC from its socket and wire up the switches. Remember to use appropriate resistor values depending on the number of LEDs each transistor is to switch. Take care with cutting the copper strips in the region of the transistors — a cut in the wrong place will cause errors in the switching.

Solder the negative (black) wire of a battery clip to the 0V terminal of the board, and solder a crocodile clip to the positive (red) wire. The clip acts as a simple switch. Finally, as a protection against possible short circuits, cover the back (soldered side) of the circuit board with lengths of insulating tape laid side by side.

Adding the LEDs

Next, prepare the display. This needs a fairly firm support, which we arranged by gluing a second card panel on to the front of the hat. Decide where each LED is to be and then use a thick pin to piece two holes about 2.5mm apart and push the LED leads through.

As shown in the figures, the anodes of all LEDs must connected to the positive rail. As you push each LED into place, check that is the right way round. The LEDs must be placed so that the wire that connects the anodes may be conveniently routed between them. Cut the leads to half length and bend each lead outward to form a hook. Work out how long a piece of wire will be needed to join all the anodes together.

Cut a length of single-core wire and strip off the insulation. Proceed from one end of the array to the other, catching the wire under each anode hook, and running a little solder into the crevice between the wire and the hooked lead. Work quickly so as not to overheat the LEDs. Test each joint before going further. When all anodes are connected, solder a short (8 — 10cm) length of light-duty flexible (multistranded) wire to one end of the connecting wire. Solder the other end of this wire to the +9V pin on the circuit board.

If your display has several LEDs in each group, connect their cathode wires together in the same way. Remember that the cathode wire is usually indicated by a 'flat' on the rim of the LED. Also, the cathode wire is the slightly shorter of the two. Having said that, it must be pointed out that some makes of LED exist in which the terminals are exactly the reverse!

Now, using the light multistranded wire, connect each cathode connection, or the cathode wires of individual LEDs to the appropriate output pins of the circuit board. Before doing this, it is important to have decided whereabouts in the hat the circuit board is to be situated. Keep the leads as short as possible. When all the connections have been made, insert a battery in the clip, attach the crocodile clip to the +9 V supply pin, and check that the display runs as expected. You can then

use sticky parcel tape to fix the circuit board and battery inside the hat, keeping them well clear of where the wearer's head will go. **ea**

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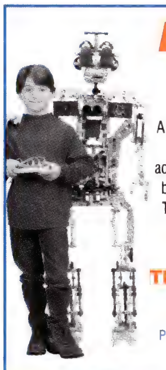

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(From page 82)

Such a configuration could deliver about two watts of audio when really pushed.

The early electric models were available in table and console cabinets. The console jobs that had a very elaborate dial mechanism. A separate drum is illuminated behind the main dial which indicates the chosen band, and was rotated in synchrony with the wave change switch. After WW2, they were released in a table model but with a large flat 'slide rule' dial. The front end circuit was essentially the same, and is reproduced in Fig.3.

The frequency range was divided into seven bands, with the coils being used in the aerial circuit as follows: (1) 13-16m, L2; (2) 16-20m, L2/3; (3) 20-25m, L2/3/4; (4) 25-31m, L2/3/4/5; (5) 31-83m, L7; (6) 75-200m, L8/L9; and (7) L10 the broadcast band. In the diagram, the switches are viewed from the spindle end in the extreme anti-clockwise end and in the phono position.

Bands 1 to 4 are selected by tappings down a common coil sharing the same primary in the aerial and RF stages, as are bands 5 and 6. Band 7, the broadcast band, has its own separate coil. There are separate two-winding oscillator coils for each band, being L19-20 for band 1 and L31-32 for the BC band.

If you trace the wiring, and just looking at S1/1 and S1/2, in the phono position, L10 is earthed to prevent any signal breakthrough. Rotating the switch one step clockwise, and ignoring for the moment the earthing connections to the junctions of L2/3/4/5, we see that C2 the tuning gang is connected to its trimmer C7 and L10 by the thick wiper of S1/2. Similar connections occur in the RF coil by S1/4 and L18/C26/C28.

In the oscillator section, the oscillator grid capacitor is C8 which connects to the osc. grid (pin 5) of the 6J8-G converter (V2) and then to S1/7. In the BC position, the padder C11 is connected in series with the tuning gang C29, and the BC trimmer C12 is connected in shunt. S1/8 then connects the tuning coil L31 to the gang. The oscillator plate connections and switching are quite straightforward.

SW connections

Imagine if you can the switchbanks being rotated an extra step clockwise. This is best done by looking at S1/2. The thick wiper connects the top of L7/8 to the tuning gang. At the same time, the earth to the bottom of L5 is opened, and the aerial and L7/8 are earthed by S1/1. A similar situation happens in the RF stage. As for the oscillator stage, the oscillator tuning coil L29 is switched in with its trimmer by S1/7.

When selecting the next band,, basically the junction of L7/L8 (and L15/L16) is earthed and the tuning gangs operate only over the smaller portion of that coil. It is hard to imagine, but series capacitors C1, C25 and C13 are only switched in when the four higher bands are selected.

The AWA receivers were intended for complete coverage from the broadcast band to the top of the 13m band at around 23MHz, with adequate band spreading for general shortwave listening. They could also tune the 160m, 80m, 40m and 20m amateur bands, back in the days when all amateur transmissions were CW or AM telephony.

Again, as with the Astor, alignment is quite a tricky procedure and more harm than good can be done by someone who is not well versed in the gentle art. Correcting badly aligned receivers of this type can take hours, not to mention the outpouring of foul language in the process.

In summary, if shortwave listening is your pet hobby, try and obtain either of these sets. The Astor may be easier to come by, since the same case housed any one of a dozen different chasses, and there were bandspread models without the RF stage as well. A quick look in the back of the cabinet, and at the dial, should reveal all. **ea**

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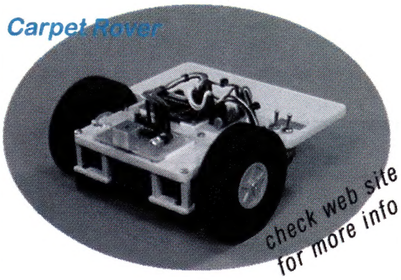

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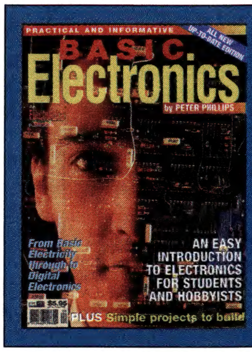
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AN EASY INTRODUCTION TO ELECTRONICS FOR STUDENTS AND HOBBYISTS
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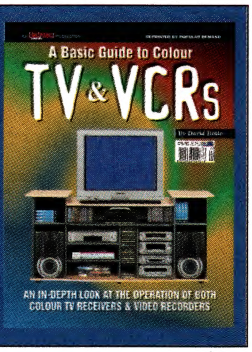

A Basic Guide to Colour
TV & VCRs
AN IN-DEPTH LOOK AT THE OPERATION OF BOTH COLOUR TV RECEIVERS & VIDEO RECORDERS

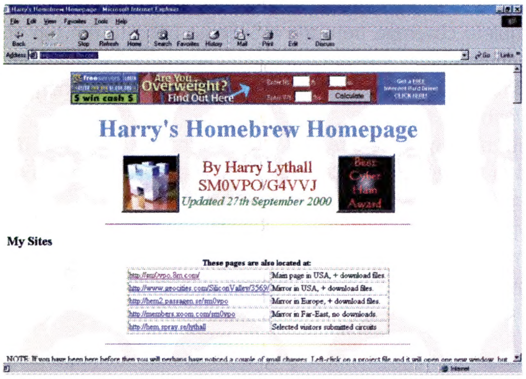
BY DARREN YATES

Bugs, hot irons and weird stuff

I'VE HEARD IT MENTIONED a few times that too many constructional projects described in magazines are boring (except for those appearing in EA of course!). So in the efforts to advance the cause (whatever it is), the "Not your average construction projects" website at **www.amasci.com/weird/const.html** is exactly that.

Now while I haven't built any of the weird things listed on this page, can I suggest you use your common sense when deciding to build something? Anything that requires nuclear material for example is probably *not* a goer. You'll find everything from a ghost-detector to a scalar electrostatic gradiometer, whatever that is and yes, I have seen it. If you can't get enough of The 'X' Files, sink your teeth into this.

BUILDING YOUR OWN FM bug transmitter is almost the first project any 12-year old tackles but how about tackling it for a Bachelor of Engineering (B.E.) degree? This web site at **www.csn.ul.ie/~francis/fyp_report** is an excellent look at one student's design from theory to "testing... one... two...". If you've ever wanted to learn about frequency modulation, how it works and more importantly how do build your own circuit, this is an excellent site that's well worth a read. It even has test results on power output with spectrum analysis results. It's quite technical but I'm pretty sure you'll be designing your own after reading this site.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Harry's Homebrew Homepage

By Harry Lythall
SM0VPO/G4VVJ
Updated 27th September 2000

My Sites

These pages are also located at:

http://sm0vpo.8m.com/	Main page in USA, + download files.
http://www.geocities.com/SiliconValley/3569/	Mirror in USA, + download files.
http://hem2.passagen.se/sm0vpo	Mirror in Europe, + download files.
http://members.xoom.com/sm0vpo	Mirror in Far-East, no downloads.
http://hem.spray.se/lythall	Selected visitors submitted circuits

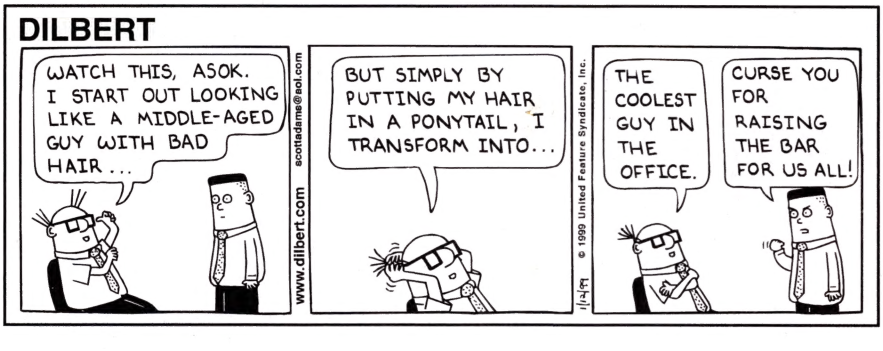
NOTE: If you have been here before then you will perhaps have noticed a couple of small changes. Left-click on a project file and it will open one new window, but

ANOTHER EXCELLENTcollection of circuits is this site from Harry SM0VPO **http://sm0vpo.8m.com** There's plenty to read here, everything from audio amps to valve receivers and transmitters. Over the last few months, I've looked at a number of sites that talk about making your own printed circuit boards. Well, this guy has another version you could try.

If you're a radio amateur, then you'll also get a kick out of the antenna projects as well. Most of the circuits here rely on 220VAC but should present few problems upping to 240VAC.

IF YOU'VE GOT the microcontroller bug, one site you shouldn't leave home without is the Atmel site **www.atmel.com** With it's compiled code and high clock speeds, Atmel micros look to be the best of the low-cost controllers on the market. This site not only includes all the latest info on new chips but also links to shareware and freeware compilers and source code editors.

If you're short of ideas and not sure how they work, the shareware page also includes application notes on how to make these devices sing. They're also a quite a deal cheaper than most of those interpreted BASIC kits as well.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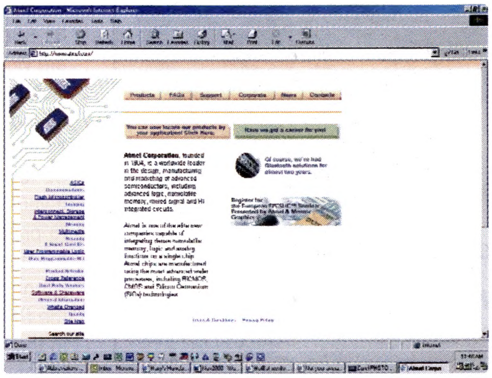
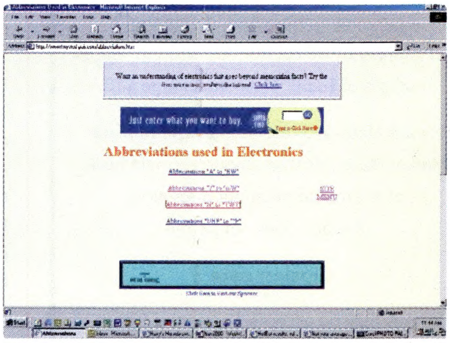


ONE OF THE THINGS that turns more than a few people away from getting into electronics is not knowing how to solder. With a little practice and the right techniques, it is actually dead easy. This site **www.aaroncake.net/electronics/solder.htm** is one of the few sites I've found that has a half-way decent photo tutorial on how to make a good, reliable solder joint. Once you've mastered the art of soldering, you're basically ready to tackle most kits available. And after you've looked through a few circuit sites, you'll be getting close to designing your own as well!



Abbreviations used in Electronics

Another thing that can turn people away is the amount of jargon. Unfortunately without it, describing projects would take 50 pages. However, this site at **www.twystedpair.com/abbreviations.htm** gives you a pretty good list of all the different symbols from mW (milliwatts) to UHF (ultra-high frequency).

Understanding the symbols is one of the keys to learning how circuits work and being able to design your own. Put this one in your favourites folder any time you come up against an abbreviation you can't remember. ea

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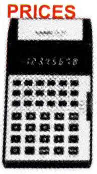
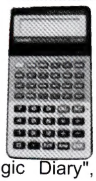


CASIO FX-39, old model calculator with a bright green 8 digit Fluorescent display, works from 2 AA batteries good quantity: $18

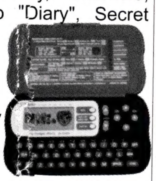
SCIENTIFIC CALCULATOR



CASIO FX-D400, 16 digit, dot matrix LCD displays alpha characters along with values and indicators, has replay function, large quantity: $26

DIARY - ORGANIZER

CASIO JD-5000BK "My Magic Diary", displays messages in one of 5 languages, English / Italian / Spanish / German / French. Modes of operation include include Telphone Directory, Schedule, Calendar, Data Memo "Diary", Secret Memory area, Time keeping, Alarm, Fortune Telling, Conversion, Calculator, Data Communication. Has an easy to understand main menu with simple icons, good quantity: $20



SCIENTIFIC CALCULATOR

CASIO FX-350D, 8+2 digits, huge quantity: $15Ea., buy 10 or more for $13.50 Ea.

MORE CALCULATORS ON OUR WEB SITE

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20ADC motor speed controller kit (K98)

$14 when purchased with the German Motor.

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JUMBO SERVO

DUAL SERVO CONTROLLER KIT

This is designed to control R/C servos with 1-2mS pulse with. Ideal for use with our Jumbo Servo kit or with std servos. Applications include testing of R/C servos pan and tilt of cameras etc. Std. kit includes PCB all onboard components, suitable case and pots. $14.... Std. Kit plus power supply suitable for powering 1 Jumbo Servo $24

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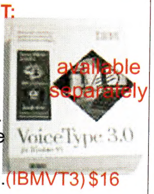

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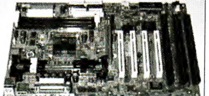

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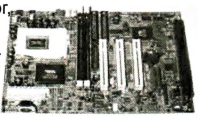

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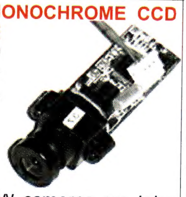

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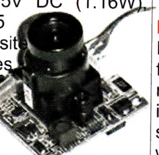

COLOUR CCD CAMERA MODULE WITH AUDIO: 12V DC (2W), PAL (50Hz, 625 lines interlaced) composite video (1V pp 75ohm). Res. 330 TV lines, 1/3" CCD sensitivity 3Lux. Has Auto-Iris. 38mm Squ. x 32mm high & unit weighs 20 grams. Inc. 3.7mm lens: (ARCB21) $180

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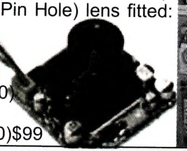

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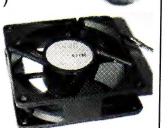

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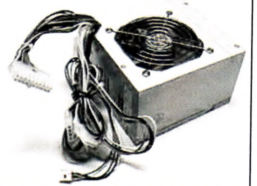

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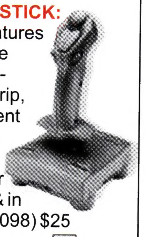

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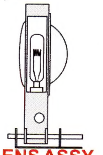

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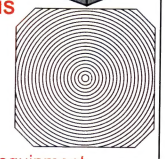

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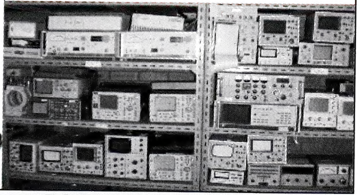

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